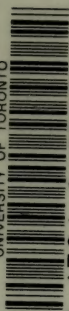



UNIVERSITY OF TORONTO



3 1761 01328623 2



Digitized by the Internet Archive
in 2013

HISTORY OF THE GREAT WAR
BASED ON OFFICIAL DOCUMENTS
BY DIRECTION OF THE HISTORICAL SECTION OF
THE COMMITTEE OF IMPERIAL DEFENCE

44 Mod
Q328

Official history of the War

THE WAR IN THE AIR

Being the Story of
The part played in the Great War
by the Royal Air Force

VOL. IV

BY

H. A. JONES



OXFORD
AT THE CLARENDON PRESS

1934

299753
7.5.34

OXFORD
UNIVERSITY PRESS

AMEN HOUSE E.C. 4
London Edinburgh Glasgow
Leipzig New York Toronto
Melbourne Capetown Bombay
Calcutta Madras Shanghai
HUMPHREY MILFORD
PUBLISHER TO THE
UNIVERSITY

D
602
R34
V.4



PREFACE

THIS volume covers naval air developments and operations in home waters throughout 1917 and for the first quarter of 1918. It includes a narrative of the anti-submarine work of the various types of aircraft during the period of unrestricted U-boat warfare, and of the diverse operations undertaken by naval aircraft based at or near Dunkirk. The remainder of the volume deals with air warfare on the Western front, beginning with the battle of Messines in June 1917 and ending with the German offensives on the Somme and on the Lys in March and April 1918.

A feature of the period dealt with was the development of air attacks against troops, transport, and similar targets on the ground. These attacks reached the peak of their intensity during the German advance on the Somme. When the situation on the Third Army front was most critical, on the 26th of March 1918, thirty-seven squadrons, out of a total of sixty working with the British armies in France, operated over the Third Army front, and twenty-seven of them were specifically engaged on low-flying attacks, with bomb and machine-gun, against ground targets.

A point of interest, which a study of the air reports has revealed for the first time, is that when the German offensive opened on the 21st of March 1918, the fog on the front of the Third Army was not so dense as along that of the Fifth Army on its right. While the happenings on the Fifth Army front were almost entirely obscured from the air in the morning, some of the observers who flew over the Third Army front saw and reported a fair amount. In other words, ground visibility, on which the defence schemes so largely depended, varied, and this must be taken into account when the varying fortunes of the defending troops are under consideration.

Throughout this volume the air story is told of necessity

against a background of naval and military operations. The reader, however, will remember that, although the air work is thus thrown into sharp relief, he is looking at only one aspect of the various battles here narrated. The background has been kept as colourless as possible, but the author has judged it necessary to make an occasional comment on the military operations. If a corrective is necessary it will be supplied by the military historian who will deal with the battles in France, covered by this volume, in subsequent volumes of the *Military Operations*. In these volumes only can material be supplied for an adequate judgement of the campaign on the Western front.

The author has again received much assistance from the President of the *Reichsarchiv*, General Hans von Haeften, as from his predecessor, General Freiherr Mertz von Quirheim, who, in particular, supplied the material from which the German air concentrations for the various battles have been set out. He records his grateful thanks to these officers and, through them, to Archivrat Major Arndt. Apart from the matter supplied by the *Reichsarchiv*, published German works, wherever they show results of the British air operations, have been widely consulted. Such sources are acknowledged in the text. The author hoped, however, to visit Potsdam to consult the relevant German records so that he might add official evidence concerning the effect of the bombing and of the low-flying operations. He was informed that the German war records were not yet sufficiently collated and that an appreciable time must elapse before it would be possible to extract the required documents. If the information becomes available before the work is completed, it will be appended to the final volume.

The author has received much help from those officers, naval, military, and air, who played a part in the operations here described, and a great number of private documents have been freely placed at his disposal. For this help,

which has added truth and colour to the story, he acknowledges his indebtedness. He expresses his thanks, also, to the Military Branch of the Historical Section, for comments and advice on the military operations, and to Professor D. Nichol Smith, who read the volume in proof and made valuable suggestions. Finally he pays tribute to the assistance he has received, as before, from the staff of the Air Historical Branch.

H. A. JONES.

TABLE OF CONTENTS

CHAPTER I. Aircraft with the Fleet, 1917-

March 1918.	pp. 1-44
Influence of the German U-boat campaign. A change of Government. Reorganization at the Admiralty.	
<i>The Grand Fleet Aircraft Committee</i>	p. 5
Admiral Beatty dissatisfied with the naval air situation. A Grand Fleet Committee appointed. Its recommendations. Aircraft-carriers. <i>The Furious</i> .	
<i>Aircraft Carrier Operations</i>	p. 14
The <i>Manxman</i> and mine-laying operations	
<i>Flying-boat Successes</i>	p. 16
The development of the flying-boat. Commander J. C. Porte. <i>Large</i> and <i>Small Americas</i> . H.M.S. <i>Baby</i> . Hunting Zeppelins over the North Sea. The <i>L. 22</i> and <i>L. 43</i> destroyed. Flying-boat and aeroplane—a combined adventure.	
<i>Catapult Experiments</i>	p. 22
Catapults—hydraulic, electric, and compressed air. Experiments at Hendon and in the hopper <i>Slinger</i> .	
<i>Fighter Aeroplanes in Light Cruisers</i>	p. 23
Flying-off platforms in light cruisers. Harwich Force experiments in 1915. A platform fitted in the <i>Yarmouth</i> , 1917. A Sopwith 'Pup' flown off. The Zeppelin <i>L. 23</i> destroyed by Flight Sub-Lieutenant B. A. Smart in the <i>Yarmouth's</i> Sopwith 'Pup'.	
<i>Deck Landings</i>	p. 26
Squadron Commander E. H. Dunning lands on the forward deck of the <i>Furious</i> . Proposal to build a flying-on deck aft. Opinion divided. Admiralty air policy. Flying from gun-turret platforms.	
<i>New Proposals for Fleet Aircraft</i>	p. 30
Admiralty plans for Fleet aircraft revised. Decisions of October 1917. And of January 1918.	
A proposed air offensive against the German High Sea Fleet. The torpedo-carrying Sopwith 'Cuckoo'.	
The appointment of a Rear-Admiral for Air.	
The <i>Furious</i> , fitted with a landing-deck, rejoins the Grand Fleet. Landing difficulties. The demand for a clear deck. The design of the <i>Argus</i> modified.	
The <i>Eagle</i> , <i>Glorious</i> , <i>Courageous</i> , and <i>Hermes</i> . Flying two-seaters off turret platforms.	

TABLE OF CONTENTS

Kite Balloons with the Fleet p. 38

The balloon, an advantage or disadvantage? A lively controversy.
Admiralty policy.

Airships p. 40

Non-rigids. Trouble with the 'North Sea' type. Reasons. Rigids
and their poor performance. Towing 'Coastals' from light cruisers.
Real value of the non-rigids.

Grand Fleet Aircraft—a general summary.

CHAPTER II. Unrestricted U-boat Warfare pp. 45-77

An Anti-submarine Division formed at the Admiralty, December
1916. Additional air patrols. The South-Western Group of air
stations. The detective work of the Naval Intelligence Division.
Difficulty of distinguishing between hostile and friendly submarines.

The critical period of April 1917. The convoy system adopted.

Felixstowe Flying-boats p. 53

The *Spider-web* patrol. Successful attacks on U-boats.

Attacks by German Torpedo-carrying Aircraft p. 55

Surprise of a new form of attack, April 1917. The sinking of the
S.S. *Gena*, 1st May. All aircraft under suspicion. Admiralty action.
Further attacks, May, June, and July. Germans abandon this form
of attack.

Ocean Convoys p. 59

Organization of the convoy system. Aircraft patrols. The Mullion
Airship Station. Difficulties of airship patrol in the southern part of
the North Sea. Loss of the *C. 17* and *C. 27*. Airship patrols abandoned
south of the Norfolk coast.

Kite Balloons p. 63

Controversy about the value of kite balloons.

The Kite Balloon Destroyer Force.

Stalking U-boats. The *U. 69* destroyed.

Additional balloon bases.

Flying-boats and U-boats p. 64

More Felixstowe flying-boat successes. Probable end of the *U.B. 36*.
Felixstowe bombed. The *U.C. 1* and *U.B. 20* destroyed.

Handley-Page patrols off the Tees.

End of the *U.C. 6*.

A Porte flying-boat adventure.

TABLE OF CONTENTS

xi

<i>The North Sea Barrage</i>	p. 67
--	-------

Minefield to close north-about route to U-boats.
Aircraft patrols.

<i>The French Coast</i>	p. 68
-----------------------------------	-------

The Cherbourg station. A seaplane destroys the *U.B. 32*.

Anti-Submarine operations from Dunkirk. German seaplane stations on the Belgian Coast.

Flanders I and II.

Dunkirk seaplanes replaced by aeroplanes.

A *Large America* flying-boat from Dunkirk destroys the *U.C. 72*.
Anti-submarine operations summarized.

CHAPTER III. Naval Air Operations from Dunkirk, 1917-March 1918	pp. 78-108
--	------------

Bombing operations. The Handley Page and the D.H. 4.

<i>The Bombardments of Zeebrugge and Ostend</i>	p. 82
---	-------

Attack on the lock-gates at Zeebrugge 12th May 1917, and on the dockyard at Ostend 5th June 1917. Aircraft co-operation.

<i>The Belgian Coast Barrage</i>	p. 86
--	-------

The barrage reinstituted, July 1917. Aircraft patrols. German bombing attacks on the ships. The *Fernlenkboot*.

<i>Bombardments of Ostend</i>	p. 89
---	-------

Attacks on Ostend by monitors of the barrage patrol, September-December 1917. Work of the naval aircraft. German smoke-screens.

<i>A projected Landing</i>	p. 90
--------------------------------------	-------

Landing operations dependent on progress of the battles of Ypres, 1917. Air photographic survey of the landing beaches.

<i>Naval Air Co-operation in the Flanders offensive</i>	p. 92
---	-------

Patrols by naval fighting aircraft. Day and night bombing.

<i>The German Bombing Squadrons</i>	p. 98
---	-------

Daylight bombing attacks on England. Effect on the Dunkirk air squadrons. Concentrated bombing attacks on the naval aircraft depot, St. Pol. The depot goes out of action. Bombing by the Handley Pages and D.H. 4s.

Importance of the photographic work of the Dunkirk squadrons. A general summary. War development of Bruges as an Imperial Dockyard.

Duel between the bomb and ferro-concrete. Standard thickness of roof and walls of protected buildings. The submarine shelters in the North Darse.

Bruges, Zeebrugge, and Ostend, as important naval targets.

Bombing operations of Dunkirk air squadrons analysed. Dissipation of effort.

Flights in British aircraft by H.M. the King of the Belgians.

CHAPTER IV. The Battle of Messines, 7th-14th

June 1917 pp. 109-137

General plan subsequent to failure of Nivelle offensive. Clearing the Belgian coast. Importance of the Messines-Wytschaete ridge. The British and German formations in the area. Air concentration for the preliminary battle. Importance of artillery operations. Main duties of the Royal Flying Corps. The scheme for the air offensive. The wireless interception organization. The German system of wireless warnings.

The opening bombardment. 'Bombardment Flights.' Air observation for the artillery. Air fighting. Death of Lieutenant Schaefer. Air reconnaissances. Bombing operations. Rehearsals of the artillery barrage.

The Attack p. 125

The explosion of mines. Contact patrol reports. Failure of infantry to light flares. Progress of the battle.

Attacks by low-flying aircraft. Feat of Captain W. A. Bishop. Low-flying attacks of a sporadic kind.

Air observation for the artillery during the attack. Bombing. Air fighting.

Consolidation. Air work curtailed.

Freiherr von Richthofen returns from leave. German pilots become more active. Influence of German air raids on England. Fighting squadrons withdrawn from France. Effect on the air position on the Western front.

Lessons of the battle.

CHAPTER V. The Battles of Ypres, 31st July-

10th November 1917 pp. 138-226

The plan of operations. British take over the Nieuport sector from the French. The Fifth Army re-formed in Ypres area. The Fourth Army move north to the coast.

Air Concentration for the Offensive p. 140

The head-quarters of the V Brigade move north with the staff of the Fifth Army. Composition of the Brigade. The IV Brigade with the Fourth Army.

The air concentration, Allied and German, summarized.

<i>Employment of Aircraft</i>	p. 143
Major-General Trenchard issues general instructions for the employment of Allied aircraft in the battle. The air offensive ordered to begin on the 8th July.	
The <i>Aerial Activity Office</i> of the V Brigade.	
<i>The German Attack at Lombartzyde</i>	p. 146
The Germans deliver a surprise attack. Why the air observers failed to report German preparations. Success of the German attack. Counter-battery work of No. 52 Squadron. Development of co-operation between aeroplanes and balloons. Also between aeroplanes and sound-ranging sections.	
<i>The Influence of Air Raids on England</i>	p. 152
London bombed for second time by daylight, 7th July. Sir Douglas Haig asked for two fighting squadrons and to make a raid on Mannheim. His protest. One squadron sent. Fighting aeroplanes diverted to Home Defence Squadrons. Sir Douglas Haig protests again. A comment.	
<i>The Preliminary Air Offensive</i>	p. 155
Bombing German aerodromes.	
Large-scale clashes in the air.	
<i>The Battle Opens</i>	p. 160
Progress of the fighting, 31st July. Weather affects flying programme. Single-seater fighters used for low bombing. Explaining the air arm to the infantry. Bad weather delays renewal of the offensive.	
<i>The Attack on Hill 70 [Loos]</i>	p. 169
A diversion near Lens. Hill 70 captured. Aircraft co-operation.	
<i>The Battle of Langemarck, 16th-18th August</i>	p. 172
The Ypres attacks resumed. A serious failure. The German 'pill-boxes'. Weather conditions prevent air observers reporting counter-attack concentrations. Work of the squadrons.	
<i>Minor Operations</i>	p. 179
Ypres area a morass. Minor operations on other parts of the front. Low-flying attacks in co-ordination with infantry. Gillemont Farm and Cologne Hill Farm.	
<i>The Battle of the Menin Road Ridge, 20th-25th September</i>	p. 180
The weather improves and ground recovers at Ypres. Offensive resumed. Scheme of employment of squadrons. Success of the battle.	

Examples of low-flying attacks. Many warnings of concentrations for counter-attacks sent from the air. Enemy formations broken up by artillery fire. Bombing operations. Air Fighting. Death of Werner Voss.

The Battle of Polygon Wood, 26th September-3rd October p. 190

A successful advance. Counter-attack warnings from the air. Heavy German losses.

Low-flying attacks. Bombing and fighting.

Development of Night Flying. p. 196

Night bombing by the Corps squadrons. First night flights in 'Camels' and Bristol Fighters. German night-bombing squadron. Attacks on the German aerodromes. Night bombing by single-seater fighters.

No. 56 Squadron. The Services and publicity. The views of Sir Douglas Haig. Air Statistics of the Ypres battles.

Broodseinde and Poelcappelle, 4th and 9th October p. 202

The Broodseinde attack, 4th October. Rain. Restricted air work. General effect of bad weather on the operations. Major objectives impossible of attainment. Why the offensive was continued.

The attack of 9th October. Contact patrols and counter-attack patrols.

Continuous rain. The attack of 12th October.

Air reports of German movements.

The bombing attack on Rumbeke aerodrome.

20th October. Further infantry attacks. Aircraft co-operation.

Death of Lieutenant A. P. F. Rhys-Davids.

Passchendaele p. 211

The capture of Passchendaele.

Developments in Artillery Co-operation, 1917 . p. 213

Increase in artillery and problems of co-operation. New battery commanders arrive in France without knowledge of latest methods of co-operation between aeroplanes and artillery. One reason is diversity of methods in use. A memorandum by Lieutenant-Colonel Ludlow-Hewitt. The need for standardization.

Propaganda by air p. 219

Dropping propaganda pamphlets from aeroplanes. Illegal according to German view. The Death Penalty. Royal Flying Corps officers sentenced to penal servitude. British Government protests. Protests effective. Propaganda by air a legitimate act of war. Special balloons.

CHAPTER VI. The Battle of Cambrai, 20th

November–7th December 1917 . pp. 227–259

The interest of the battle of Cambrai. Reasons for the battle. Plan of operations. Overwhelming air concentration. No preliminary bombardment. Special air arrangements. Discreet air patrols. Bad flying weather helps surprise. The experience of a German flying officer. The opening of the battle. Mist. Low-flying attacks by single-seater fighters.

The check at Flesquières. Personal accounts of flying pilots. Heavy casualties to low-flying aeroplanes.

Corps aeroplanes in the mist. Nothing seen of the Flesquières check. Bombing operations.

The importance of Bourlon Wood. The advance resumed, 21st November. Rain and low clouds. The position on the evening of the 21st. Disquiet. The case for withdrawal. Sir Douglas Haig decides to go on. Air reports of German reinforcements. The attack of 23rd November. Part played by German anti-aircraft guns used as anti-tank weapons. Richthofen's 'Circus' arrives from Flanders. All *Jagdstaffeln* placed under Richthofen. Intense low-flying attacks, German and British, on the 23rd. Royal Flying Corps low-flying casualties, 30 per cent.

The struggle for Bourlon village.

Influence of the Richthofen 'Circus'. Provision of fighter escorts.

Warnings of a German counter-stroke. Confidence at General Head-quarters. Some of the bombing activity diverted to other fronts. The German counter-offensive, 30th November. Mist. A tactical surprise in the south. Reasons for the surprise. Part played by German low-flying aircraft. The attack at Bourlon. Concentration of aeroplanes in the area. German low-flying attacks. Some of the results. Attack and counter-attack. The Bourlon positions abandoned.

General comments. Low-flying attacks the feature of the battle. German staff views on their value.

CHAPTER VII. The German Offensive, 1918.

The First Battles of the Somme, 21st

March–5th April pp. 260–365

Lessons of the Cambrai battle. Schemes for defence. Employment of Royal Flying Corps when army is on defensive. Importance of reconnaissance. Extension of British line. The German plans. Appreciation of German intentions by Fifth Army commander. Views of G.H.Q. Influence of air reports. Value of air photographs. Infantry warned, 20th March, attack would be made next morning.

Air Concentrations for the battle p. 271

Particulars of British and German concentrations. German air service outnumbers British in battle area. German air reorganization and expansion 1917–18 reviewed. *Kriegsspiele*.

Air Operations before the battle p. 277

Guiding policy, 'interference with enemy preparations'. Co-operation with the artillery. A word about the Corps Squadrons. Bombing programmes and operations. Attacks on German aerodromes.

The air offensive. Discussion about size of fighting formations. Schemes of air patrol.

Air combats.

The Offensive begins p. 290

Schemes for employment of squadrons once the German attack had begun. 4.45 a.m. on 21st March. Fog.

Morning visibility better on Third than on Fifth Army front. Air reconnaissances of Third Army front. Fog lifts about 1 p.m. Subsequent air work. Widespread German movements reported. German low-flying activities. Intense air fighting. Evidence from German side of effect of British air attacks. Extent of German advance. Air squadrons move back.

Fog again, 22nd March. German advance renewed. A critical situation. Low-flying attacks. Strategic bombing. Air offensive patrols. Night bombers give information of German reinforcements. Fifth Army withdraw further. 23rd March, a gap in the line. Contact-patrol reports mirror the battle. Low-flying attacks, bombing, and air fighting. Germans exploit the gap, 24th March. Air reports show threat developing. British low-flying attacks intensified. Air fighting increases and at lower heights.

25th March, day of crisis. A wedge between French and British. Exploiting gaps on Third Army front. Air messages report German masses, but British guns mostly silent.

All available squadrons diverted to Third Army front to attack enemy. 'Very low flying is essential. All risks to be taken.'

Night bombing in hail and snow.

Low-flying attacks begin at dawn, 26th March. A day of bitter fighting. Third Army crisis ends.

Desperate plight of Fifth Army. Air reports of the threat to Roye. British and French diverging. Low-flying attacks to stem advance on Roye. Enemy air activity falls away.

The appointment of General Foch.

Night bombing operations.

Amiens as the German objective. Air operations on Third Army front, 27th March. V.C. award to Lieutenant A. A. McLeod. Concentration of low-flying attacks south of the Somme. Night bombing to help Fifth Army.

Attack at Arras, 28th March, and fight for Amiens continued. Remnants of Fifth Army absorbed by Fourth Army. An appreciation of the Fifth Army. Low-flying attacks continued mainly south of the Somme.

Air fighters begin to return to the upper air.

Bombing railway junctions.

General Foch's air instructions. A comment. Change in air tactics.

Air fighting formations concentrated.

German attacks on 5th April end in failure. The line settles down.

Aerodrome and Supply Organization . . . p. 353

Difficulties of aerodrome accommodation and of maintenance during the retreat. How aerodromes were chosen. Emergency supply schemes of Brigadier-General Brooke-Popham. Removal of the depots from Candas and Fienvillers. A tribute to the air mechanics.

Work of the air squadrons in the March retreat. Service controversy. Breakdown of co-operation with the artillery. Reasons. General comments. Opportunities missed by the German air service. Breakdown in German air supply and in communications. Comments of General von Hoepfner.

CHAPTER VIII. The Battles of the Lys, 9th-

29th April 1918 . . . pp. 366-404

Air reports of an enemy concentration north of La Bassée. Views of G.H.Q.

British and German dispositions.

The Battle opens . . . p. 374

The attack made in fog, 9th April. Portuguese overwhelmed. No flying until 2 p.m. No. 208 Squadron burn their aeroplanes. Contact patrols in the afternoon plot the German advance. Low-flying attacks. Squadrons go on the move. The battle area extends, 10th April. Ground mist and low clouds. Low-flying attacks in the mist. Casualties.

Contact patrols from low heights.

Gaps in the line, 11th April. Fighter squadrons concentrated on low-bombing attacks.

Bombing railway junctions.

A critical day, 12th April. Sir Douglas Haig's 'backs to the wall' order. Fine weather leads to great air activity. The progress of the battle clearly reported by the contact-patrol observers. Low-flying attacks concentrated to stem advance on Hazebrouck.

Bombing the German lines of communication. Attacks on German observation balloons. Traffic to the battle area bombed by night. The German advance slackens.

The attack on Villers-Bretonneux . . . p. 387

Indications of a renewal of the offensive on the Somme. Air reports of night activity at Chaulnes railway junction. The junction bombed. Germans attack with tanks, 24th April. Poor visibility. Contact patrols from a low height.

Death of Freiherr Manfred von Richthofen. His career and an estimate.

The Loss of Kemmel Hill p. 397

The Lys attack resumed, 25th April. Germans take Kemmel. Air reports of traffic congestion. Long-range gun-fire and bombing attacks. Low bombing in the battle area. German aeroplanes very active.

Arrangements in being to divert all head-quarters fighter squadrons to low bombing. The battle dies down in bad weather.

Supply and repair difficulties during the battle. How they were overcome. The emergency depot at Guines. Subsidiary depots at Desvres and Motteville.

Wastage in British aircraft during the German March-April offensive. Losses in equipment and stores.

Difficulties of the German air service during the Lys battles. Air superiority passes to the Allies after second day. Complaints from the German infantry. German communications again break down. General von Hoeppner's comments.

APPENDICES

	PAGE
I. Admiralty Memorandum on Naval Air Policy (August 1917)	407
II. Anti-Submarine Results. By Various Types of Aircraft, 1917	408
III. Order of Battle, Royal Flying Corps, 7th June 1917 (Messines)	409
IV. Daily Artillery Results by the Second (Corps) Wing—15th May to 9th June 1917	413
V. Order of Battle, Royal Flying Corps, 31st July 1917 (Ypres)	414
VI. Battles of Ypres, 1917. R.F.C., H.Q. Orders for bombing and machine-gun attacks	418
VII. V Brigade R.F.C. Order, 31st July 1917.	421
VIII. 9th Wing, R.F.C. Order, 31st July 1917.	422
IX. The Battle of Cambrai 1917. R.F.C. H.Q. Instructions to I Brigade and Ninth Wing.	424
X. Order of Battle, Royal Flying Corps, 20th November 1917 (Cambrai)	426
XI. Battle of Cambrai. III Brigade, R.F.C. Special Operation Order	431
XII. Employment of Battle Flights. German Memorandum of February 1918.	433
XIII. Extract from German Manual 'The attack in Position War- fare', dated 1st January 1918. VI. Air Forces	439
XIV. The Employment of the Royal Flying Corps in Defence. (Memorandum issued by G.H.Q. January 1918)	444
XV. Order of Battle, Royal Flying Corps, 21st March 1918 (German Offensive)	446
XVI. Comparative Table of Changes in Strength of British and German Air Services during the German Somme Offensive 1918.	} after 451
Table A. British and opposing German	
Table B. German Air Strength opposing the French	
XVII. Development of Aerial Fighting. (H.Q., R.F.C. Memorandum of December 1917)	453
XVIII. Orders of General Foch (translated), 1st April 1918	456
XIX. Brigade Strength in Squadrons, 9th April 1918. (Battles of the Lys)	} after 458
INDEX	

LIST OF MAPS

1. Sphere of Naval Air Operations in Home Waters 1917-1918	<i>To face p.</i>	I
2. Seaplane and Flying-Boat Patrols. South-Western Group of Air Stations, July 1917		48
3. North Hinder Flying-Boat Patrol (Spider-Web), April 1917		53
4. Battle of Messines, 7th June 1917. Disposition of R.F.C. Corps Squadrons		109
5. Battles of Ypres, 1917		137
6. Battles of Ypres, 1917. Disposition of Royal Naval Air Service and Royal Flying Corps Squadrons, 31st July 1917		212
7. Battle of Cambrai, 20th November-7th December 1917		227
8. Battle of Cambrai. Scheme of Employment of the Royal Flying Corps, 20th November 1917 . . .		244
9. German Offensive on the Somme, March 1918 . . .		267
10. German Offensive on the Somme, March 1918. Disposition of British and German Aircraft Units, 21st March 1918		364
11. German Offensive on the Lys, April 1918		404

SPHERE OF NAVAL AIR OPERATIONS

IN HOME WATERS, 1917-1918.



CHAPTER I

AIRCRAFT WITH THE FLEET

1917—March 1918

Developments and Operations

[Map facing.]

IN 1917 there were important developments in all branches of naval air work. Some were made possible by the trials and patient organization of the earlier years of warfare. One, the introduction of the aeroplane, or land aircraft, for fleet work, was revolutionary. Another, the development of the large flying-boat for reconnaissance, and as an offensive weapon, with the southern part of the North Sea for its field of operations, was due in great measure to the faith and persistence of one flying officer.

The direction of the naval air expansion was greatly influenced by the German U-boat campaign. The battle of Jutland left Admiral Scheer with no illusions. He knew, as he says in his book, *Germany's High Sea Fleet in the World War* (p. 169), that no possible action by the German fleet could overcome the British naval blockade and, in a report to the Emperor wherein he summarized his final impressions of the battle, said: 'A victorious end to the war at not too distant a date can only be looked for by the crushing of English economic life through U-boat action against English commerce.'

Before any decision was reached for an extension of U-boat warfare, Scheer had made his August 1916 sortie into the North Sea. He did not, on that occasion, risk contact with Admiral Jellicoe's forces, but successful action by his U-boats had led to a revision of the policy of the employment of the Grand Fleet. The light cruisers *Nottingham* and *Falmouth* had been torpedoed in the swept areas off the East Coast, and, in consequence, Admiral Jellicoe had urged that the Grand Fleet should not again be taken south of the Dogger Bank or east of longitude 4° E. unless every class of vessel was protected by anti-submarine screens; with this view the Admiralty agreed.

In October 1916 a new, but restricted, U-boat campaign

began, and Admiral Scheer no longer had the Ems and Flanders submarine flotillas at his disposal for operations with the High Sea Fleet. He tried a sortie without their help in this month, but nothing came of it, and the German Fleet went back to its harbours. There ensued a position of deadlock between the opposing fleets which endured until 1918.

Meanwhile controversy on the subject of U-boat warfare was having political and service reactions in Germany and in England. In Germany the naval chiefs, led by Admiral von Holtzendorff, the Chief of the Naval Staff, conducted an intensive propaganda for the abolition of all restrictions against the employment of the U-boats. Holtzendorff knew that lawless submarine warfare might bring America into the war alongside the Allies, but he argued that America was not to be feared as she could do nothing effective. Dr. von Bethmann Hollweg, the Imperial Chancellor, and Herr von Jagow, the Minister for Foreign Affairs, opposed the naval staff, on grounds of expediency rather than morality, but when the military chiefs, Hindenburg and Ludendorff, ranged themselves with their naval colleagues, it was obvious that a decision for unrestricted submarine warfare was merely a matter of time. The new policy, in fact, was put into operation on the 1st of February 1917. To the student of psychology, the shifts and manœuvres by which Germany came to the final announcement of her intentions are of interest. The events which led to the decision are revealed in published German official documents and in the memoirs of the protagonists: they are also well summarized in the British official naval history (*Naval Operations*, vol. iv, ch. vii).

In England those who were in the best position to judge foresaw that Germany would stake everything on the submarine. Admiral Jellicoe had continuously urged the adoption of more energetic measures to combat the U-boats. 'It seemed to me', he says, 'questionable whether 'our organization at the Admiralty included a sufficiently 'numerous and important staff, having as its sole business 'the work of dealing, rapidly and effectively, with the problem which was assuming such very serious proportions.

'It did not appear that new proposals and inventions for dealing with the submarine campaign were being pushed forward with the necessary rapidity, possibly because of the absence of such an organization, and of the difficulties connected with labour and *matériel*; and generally it seemed doubtful whether the dangers confronting us would be successfully combated.'¹

In a letter to the Admiralty, written in October 1916, Admiral Jellicoe had defined these dangers. 'Our losses in merchant ships,' he said, 'combined with the losses in neutral merchant ships, may, by the early summer of 1917, have such a serious effect upon the import of food and other necessities into the Allied countries as to force us into accepting peace terms which the military position on the Continent would not justify, and which would fall short of our desires.'

It was, indeed, clear that there must be a wide revision of our existing methods of conducting the war. On the 22nd of November 1916 Admiral Jellicoe, who had previously been invited to London to confer with the Government, was offered the post of First Sea Lord. A week later he left the *Iron Duke* for Whitehall and was succeeded as Commander-in-Chief by Admiral Sir David Beatty. On the 4th of December Mr. Asquith, the leader of the Coalition Government, resigned, and Mr. Lloyd George formed his Coalition Government three days later. Mr. Lloyd George created the War Cabinet of four or five members, freed from departmental duties, whose decisions on all matters affecting the conduct of the war were to be absolute.

At the Admiralty Mr. Balfour was succeeded as First Lord by Sir Edward Carson, and a new Board of Admiralty was formed.² On the 18th of December 1916 a special division for the co-ordination and control of all anti-submarine operations was set up at the Admiralty

¹ *The Grand Fleet 1914-1916*, by Viscount Jellicoe of Scapa, pp. 456-7.

² Sir Edward Carson, First Lord; Admiral Sir John R. Jellicoe, First Sea Lord; Admiral Sir Cecil Burney, Second Sea Lord; Rear-Admiral F. C. Tudor Tudor, Third Sea Lord; and Commodore Lionel Halsey, Fourth Sea Lord.

under Rear-Admiral A. L. Duff, previously Second-in-Command of the 1st Battle Squadron.

It was not long before the Board of Admiralty was itself expanded. The War Cabinet, soon after its formation, approved proposals for a reorganization of the production and employment of aircraft which had been formulated by its predecessor, the War Committee, in November 1916. One of these proposals was for the addition to the Board of Admiralty of a Fifth Sea Lord, who would be able to speak, as the naval representative on the Air Board, with an authority similar to that of the War Office representative, who was a member of the Army Council. Rear-Admiral C. L. Vaughan-Lee, who held the existing Admiralty appointment of Director of Air Services, was succeeded by Commodore G. M. Paine, who became Fifth Sea Lord on the 31st of January 1917.¹

These political and service changes were destined to exert a powerful influence on naval air policy and expansion. With Admiral Jellicoe at the Admiralty, where he could give practical expression to his views, and with Admiral Beatty, a firm believer in the value of the air weapon, as Commander-in-Chief, progress in the development of aircraft co-operation with the Grand Fleet was rapid. The establishment of the special anti-submarine division at the Admiralty led also to a great increase in the activities of all types of anti-submarine aircraft. There was little in common between these two lines of progress. The expanded use of aircraft in anti-submarine warfare was chiefly a matter of training, reorganization, and systematized co-ordination with other U-boat counter-measures. But the development of aircraft co-operation with the Fleet at sea involved problems of design and practice which necessitated much research work and pioneer experiments which called for a high degree of skill and cold courage. As shall be told, such

¹ Commodore Godfrey Paine was an officer of great air experience. He had qualified as a pilot in May 1912, and had thereupon been appointed first Commandant of the Central Flying School. He had held this appointment until 1915, when he took command of the Royal Naval Air Service Training Establishment at Cranwell.

progress was made towards the solution of these problems as laid the foundations for much of the immediate post-war organization of this branch of naval air work.

So long as the High Sea Fleet was in being, Admiral Scheer might decide at any moment to resume his sorties, and the Grand Fleet had, at all times, to be in a state of readiness. Operations, indeed, to attract Scheer to sea were planned from time to time, but the German Fleet, although it continued to be a menace, became, in effect, a coast defence force whose duty was to keep the Bight of Heligoland secure for the passage of the incoming and outgoing U-boats.

The major activities of the Grand Fleet were therefore directed to the covering of mine-laying operations in German waters to limit and define the passage of the U-boats. In January 1917 Admiral Beatty urged that shallow and deep mines should be laid in a semicircle across the Heligoland Bight, and that the line, when complete, should be watched by light cruiser and destroyer sweeps, at varying intervals, and by submarines. This project could not be sanctioned because there were not sufficient mines to be had, and, instead, it was decided that independent minefields should be laid along a semicircle between Ameland and the Schleswig coast. The main air work with the fleet was associated with this mining policy. It was directed against the German airships and seaplanes which patrolled extensively, reconnoitred the minefields, assisted the German mine-sweeping flotillas, helped to guide the U-boats through the swept channels, and, at times, watched the British mine-layers at their work.

The Grand Fleet Aircraft Committee

On the 21st of January 1917 Admiral Beatty, dissatisfied with the naval air situation, wrote to the Admiralty asking what policy their Lordships intended to pursue in regard to the Royal Naval Air Service. Five days later, before he received a reply, he set up a special committee of the Grand Fleet under Rear-Admiral Sir Hugh Evan-Thomas

to report on the Fleet's air requirements. On the 5th of February 1917 the Committee presented a comprehensive report.¹

The members of the Committee, it was stated, had, in accordance with their terms of reference, considered the air requirements of the Grand Fleet as follows:

- (i) Reconnaissance over the North Sea.
- (ii) Screening of the Fleet by aircraft while on passage.
- (iii) Heavier-than-air craft for duty with the Fleet.
- (iv) Seaplane Carriers.
- (v) Use of seaplanes and balloons as aids to gunnery.

They recommended that systematic reconnaissance of the North Sea should be a duty of large flying-boats supplemented by non-rigid airships. Airships, also, of the 'Coastal' or 'North Sea' type, should provide a screen when the Fleet left its bases by daylight.²

The duties of the heavier-than-air craft were defined as close reconnaissance, and attacks on German airships. For the latter duty it was recommended that Sopwith 'Pup' aeroplanes should replace the Sopwith 'Baby' seaplanes in the *Campania*, as it had already been decided they should do in the *Manxman*.

This recommendation is of importance. The *Manxman*, a former passenger steamer on the Isle of Man service, had been commissioned in December 1916 to carry seaplanes aft for reconnaissance and Sopwith 'Baby' seaplanes forward to fight Zeppelins. Flight Commander F. J. Rutland had been appointed to the new

¹ The Report was signed by Rear-Admiral Sir Hugh Evan-Thomas, Captain C. M. de Bartolomé, and Flag Commander Wilfred A. Egerton.

² In Grand Fleet Battle Orders dated 24th of January 1917 this duty had been provided for. All available airships from Kirkwall, Longside, and East Fortune, were, by order of the Commander-in-Chief, to rendezvous with the Fleet if the Fleet concentration was west of longitude 2° E. The airships were to be informed of the course and speed of the Fleet and were then to scout ahead and to the flanks of the light cruiser screen. If U-boats were sighted, their positions were to be reported, and the airships were to attack with bombs. If enemy airships were sighted, the British airships were to fall back on the light cruiser line. These were the first naval orders of their kind to British airships.

carrier before she was commissioned, and he was soon advocating that aeroplanes should be carried instead of the 'Baby' seaplanes. He argued that the 'Pup' aeroplane was the only craft capable of getting to the 'ceiling' of a Zeppelin, that, fitted with airbags, the 'Pups' were safer on the water than the 'Baby' seaplanes, that they were a better match for other aeroplanes which might be encountered at sea and, finally, that the adoption of a fighter which was being manufactured for the Western Front would ensure supplies being available and would also enable the Naval Air Service to take advantage of improvements embodied in the type from time to time as a result of fighting experience in France. This officer had made the first of two flights off the deck of the *Manxman* in January 1917 in one of the 'Baby' seaplanes and he had found that the run given by the deck of the ship necessitated a good wind before the seaplane could get away. The adoption of aeroplanes, which could be flown off the deck under less exacting conditions, would increase the number of occasions when aircraft could be used. Largely as a result of his advocacy and of the trials with the 'Baby' seaplanes, Sopwith 'Pup' aeroplanes had been allotted to the *Manxman*.

As fighters could be flown from the deck when the weather conditions were against the heavier two-seater seaplanes, the Committee recommended that the fighters should be fitted with a small wireless transmitting set of a range of about five miles. The fighting pilots would then be able, when the occasion arose, to communicate to the ships in the extended cruiser line important information about enemy vessels.

The estimate of the Committee was that the Grand Fleet would require twenty anti-Zeppelin aircraft and a similar number of reconnaissance aircraft. The latter, it was calculated, would provide for two aircraft in the air during the time the opposing fleets were gaining touch, and one in the air throughout the subsequent action.

It will be of interest to consider the resources, in aircraft, of the Grand Fleet at the time the Committee made

their report. They were carried in the three aircraft carriers as follows:

	<i>Speed in knots.</i>	<i>Reconnaissance (two-seater) Aircraft.</i>		<i>Anti-Zeppelin (single-seater) Aircraft.</i>	
		<i>No.</i>	<i>How sent up.</i>	<i>No.</i>	<i>How sent up.</i>
<i>Campania</i>	18 to 21	6 seaplanes	From deck	6 seaplanes	From deck.
<i>Engadine</i>	18	2 seaplanes	Off the sea	2 seaplanes	Off the sea.
<i>Manxman</i>	16 to 18	4 seaplanes	Off the sea	4 aeroplanes	From deck.

The Grand Fleet was thus considerably below the establishment considered by the Committee as the minimum, and what made matters worse was the low speed of the *Manxman* which, in moderately rough weather in the open sea, had proved to be much under the estimate (21 knots) given for her before she was commissioned: there was small chance that she would ever be able to take part in a fleet action. Furthermore, it should be remembered that the *Campania*, in which most of the fleet aircraft and balloon reconnaissance and spotting work had been developed, had been on the sea for nearly twenty-four years. She had been drastically reconditioned, and those who knew her best considered that she was still splendidly sound for work in the open sea, but, whether she was or not, it seemed obvious that her future employment must chiefly be for training and experimental work.

There must be new carriers, but where were they to come from? So that the Committee's further recommendations may be appreciated, it will be necessary to consider briefly the general position with regard to new carrier construction. As early as August 1915 outline plans for a special seaplane-carrying cruiser had been prepared by Lieutenant Gerard R. A. Holmes, R.N.V.R., in co-operation with Sir John H. Biles, the naval architect. Lieutenant Holmes, a former assistant naval architect to the Cunard Company, had been serving in the *Riviera* from the beginning of the war. His design embodied many fine features and was, in some respects, ahead of its time. The suggested method of re-shipping the seaplanes, while the vessel was under way, was by means of a slip, or slope, extending into the sea from the tail end of the ship. The

Director of the Air Department had recommended the scheme to the Board but, after much discussion and delay, it had been rejected, and, instead, the *Manxman* had been taken over for conversion. The reason for rejecting the proposed new carrier was stated to be the existing congestion in the ship-building yards, but it may also be inferred that the Admiralty was unwilling, at that time, to devote resources to a highly experimental proposition, more especially as it seemed unlikely that the ship could be completed and made efficient during the progress of the war. Furthermore, it was considered that an essential feature of the design submitted by Lieutenant Holmes was the slip method of re-shipping the seaplanes, and expert opinion was doubtful whether this could be made a practical proposition.¹ Sir John Biles, unwilling to let the matter rest, had sent the fully developed plans to Admiral Jellicoe, then Commander-in-Chief, who had urged the Admiralty, in May 1916, to lay down a vessel of the type as soon as possible. Alternatively, if this was judged impossible, he had suggested that some of the features in the designs sent him might be embodied in the *Glorious* class of large light cruisers then building.²

Thereupon the Board had again considered the question. While the matter was being debated, successful flights, by two-seater seaplanes, from the deck of the *Campania*, and the seaplane reconnaissance flight made from the *Engadine* during the battle of Jutland, had created an atmosphere at the Admiralty more favourable to the consideration of new carrier construction. As, however, there was little prospect of building a large new vessel in less time than fifteen to eighteen months, the Admiralty decided to acquire two Italian liners, in frame in shipyards,

¹ When the *Hermes* came to be planned, the scheme of landing on a slip at the tail end of the ship was embodied as part of the original design. Mr. J. H. Narbeth, the Assistant Director of Naval Construction, who was very closely associated with the designs of most of the war-time aircraft carriers and balloon ships, was anxious to work Lieutenant Holmes's idea into the *Hermes*, as an experimental system supplementary to all others. Much time was spent in designing details of the proposed slipway, or float, to enable seaplanes to taxi into the ship from the sea, but the scheme was finally abandoned as impracticable. ² *Glorious*, *Furious*, and *Courageous*.

on which work had been suspended from the outbreak of war. This decision was recorded in August 1916, but in the following month, owing to the urgent need for other naval construction, it was decided to take over only one of the two vessels. This ship, the *Conte Rosso*, built at Messrs. Beardmore's, was renamed the *Argus*. She was entirely redesigned above the water-line, and it can be said that she was the first large vessel (15,750 tons displacement) to be specially fitted out, during construction and completion, for service as an aircraft carrier with the Fleet: she was launched in December 1917.

Although the Board had decided not to proceed with the building of an entirely new ship, they were in no doubt that a specially designed carrier would be of greater value than a converted liner, and they instructed the Director of Naval Construction to prepare, for the future consideration of the Board, designs for an ocean-going carrier of not less than 25 knots speed.

The Grand Fleet Aircraft Committee were mindful of the fact that the *Argus* could not be ready before the end of 1917, and, as they judged that the need of the Fleet was urgent, they suggested that the large light cruiser *Furious*, then completing in Messrs. Armstrong's shipyard, would be of more use as an aircraft carrier than as a heavy gun-platform for which she had been designed. She had high speed, wide deck space, and a long forecastle, and, because of her bulges, she would be comparatively safe from torpedo-attack. The Committee outlined modifications in her design by which a number of reconnaissance aircraft could be housed and flown off her deck.

To meet the deficiency in fighting aircraft, they recommended that certain light cruisers and other selected ships should be immediately fitted to carry Sopwith 'Pup' aeroplanes. Although some loss of gun-power might result, it was essential, they said, that the Grand Fleet should have the means to attack Zeppelins.

The Committee also made important recommendations on the subject of balloons for fleet work. The three balloon ships, *Canning*, *City of Oxford*, and *Menelaus*, should, they said, be paid off and arrangements made for storing the

balloons ashore. The balloons could be inflated, as required, and taken to sea in fighting ships.¹

A close examination of the Committee's recommendations reveals a somewhat startling change in naval views. The significance of the report is the advocacy, by senior naval officers, of a sacrifice of gun-power in favour of aircraft. In the words of the Committee, it was a 'drastic measure' to recommend the conversion of the *Furious*. Sir David Beatty, forwarding the report to the Admiralty on the 7th of February 1917, expressed his general agreement with the recommendations, but stated that, although the provision of anti-Zeppelin aircraft and suitable ships to carry them was most important, he was not prepared 'to sacrifice the gun-armament of light cruisers in order to use them as seaplane carriers'. Nor could he approve the removal of the heavy guns (two 18-inch) from the *Furious*, although he agreed that it was essential that every effort should be made to render the ship an efficient aircraft carrier, especially as the *Argus* could not be expected to join the Grand Fleet until the end of the year.

The report led to considerable discussion at the Admiralty and brought to light divergent views about the value of the *Furious* as a fighting ship. It was argued on the one hand that, offensively, the *Furious* would be able to out-range anything afloat and that, defensively, she would be enormously superior to a small light cruiser. Those who supported these views went on to point out that the speed and power of the *Furious*, *Courageous*, and *Glorious* would be such that they should be able, in all weather conditions, to brush aside the enemy's light cruiser forces and place themselves, with reference to the enemy's battleships or battle cruisers, in a position from which they would be able to use their torpedoes, and their guns, with great effect. It was also argued that their very high speed would ensure that they would be first on the scene in the event of raids or invasion with which it was thought they could most seriously interfere before being

¹ The *Menelaus* became an ammunition carrier. The *City of Oxford* was reconverted as a seaplane carrier for service in the Mediterranean. The *Canning* was retained.

driven off or succumbing. It was not contended that these vessels should be thrown into the line of battle, but, by making use of their great speed and long-range gun-power, it did appear, as it appeared to Lord Fisher who conceived them, that they would provide a support of no mean value to the Battle Cruiser Force which was none too strong.

These views on the fighting value of the *Furious* class of ships, however, were by no means generally accepted. Those who disputed them stated that, although the *Furious* was decidedly better protected than a light cruiser, she would be in no way fit to come under the guns of a battle-ship or battle cruiser. Her fate, if she did, would be the same as that, in the Jutland battle, of the *Defence* and the *Warrior*, both ships with considerably superior protection to the *Furious*. They therefore argued that if the *Furious* could be fitted as an aircraft carrier without delaying her completion unduly there was no doubt that she should be so fitted.

It was in this sense that the Admiralty decided, and, in the result, three schemes for the alteration of the *Furious* were prepared and sent to Admiral Beatty for his comments. The Commander-in-Chief replied that, if the cruiser was to be converted into an efficient carrier, there was no option but to accept the most drastic of the proposed modifications, that is to say, the removal of the forward 18-inch gun and turret mounting, a reduction in the arc of training of the two foremost 5·5-inch guns, and the removal of the torpedo-net defence fittings. It was realized that the removal of the more important part of the main armament would make the *Furious* of little value as a fighting ship.¹

The question was again considered at the Admiralty on the 13th of March 1917 and, six days later, it was finally decided that the complete conversion of the *Furious* as an aircraft carrier should be put in hand. The plans allowed for a hangar to house about ten aircraft in the fore-castle

¹ The gun armament of the *Furious*, as originally designed, was two 18-inch guns in single turrets fore and aft, eleven 5·5-inch guns, and two 4-inch anti-aircraft guns.

deck forward, with the hangar roof extended to the bow of the ship to form a flying deck 228 feet long and fifty feet wide. From this deck it would be possible for reconnaissance and fighting aircraft to fly off under almost any weather conditions. The *Furious* was duly completed in accordance with these plans and was commissioned in July 1917 under the command of Captain Wilmot S. Nicholson, R.N., with Squadron Commander E. H. Dunning as his senior flying officer. Her maximum speed was given as 31 knots and her displacement as 19,100 tons. She was equipped with three Short reconnaissance seaplanes, and five Sopwith 'Pup' aeroplanes for anti-Zeppelin work. The flying officers appointed to the ship had undergone a special course of training in deck flying at the Isle of Grain.

The conversion of the *Furious* was a major result of the report submitted by the Grand Fleet Aircraft Committee, but other carrier construction, entirely independent of the Committee's recommendations, was undertaken in 1917. In January the Government had decided that the whole national ship-building programme must be examined on the assumption that the war would last through the year 1918. Commodore G. M. Paine, the Fifth Sea Lord, had thereupon submitted a proposal for the acquisition of five small carriers and one ocean-going aircraft carrier, but the Board of Admiralty ultimately embodied, in their general statement of requirements, four carriers for the replacement of possible losses. When the Government signified their approval, in February 1917, the Admiralty decided that two of the carriers must be ocean-going, and the other two of the North Sea, or *Vindex*, type. As the need for the latter type was urgent, and as the laying-down of entirely new ships would mean considerable delay, two merchant vessels, then under construction, the *Stockholme* and *Nairana*, were taken over. The *Stockholme*, renamed the *Pegasus*, of 3,300 tons displacement, was launched in June 1917 and was completed before the end of August: she had a speed of twenty to twenty-two knots, could stow nine aircraft (five single-seater fighting aeroplanes forward and four two-seater seaplanes aft), was fitted

with a flying-off deck forward, and had two cranes aft for the handling of her seaplanes. The *Nairana* (3,070 tons, maximum speed 19·5 knots), which was completed in September 1917, was similarly arranged, but she could only stow eight aircraft (four aeroplanes forward and four seaplanes aft). These two carriers, which were based at Rosyth, were chiefly used for training pilots in deck flying for service in battle cruisers and light cruisers, but they did, in addition, much spotting practice and also went out with the Battle Cruiser Force on sweeps into the North Sea. To hoist out the seaplanes it was not necessary for the carriers to stop. The aircraft could be slipped from the cranes on a quick release hook while the ship was steaming at nineteen knots, and they could be hooked on again when the speed was six knots.

Designs for the two ocean-going carriers were prepared in April 1917, and orders for the ships were placed. The orders were, however, cancelled almost at once, but, in July, it was decided to proceed with one of the ships, and a contract for a vessel to be called the *Hermes* was placed with Messrs. Armstrong. This ship, however, the first to be designed specifically as an aircraft carrier, had not been launched when the war ended.

In August 1917 the Admiralty again reviewed the aircraft carrier position, and decided to give instructions for the modification of the light cruiser *Cavendish*, one of five ships of the *Raleigh* class which were being built at Belfast. The *Cavendish*, as redesigned, was to carry six folding aeroplanes, and was to be fitted with a flying-off deck forward and a landing deck aft. Renamed the *Vindictive* (maximum speed 29·75 knots) she was commissioned in October 1918 and was working at Scapa when the Armistice came.

Aircraft Carrier Operations

As has been told the main British Fleet activity in 1917 was connected with the mining of the Heligoland Bight. These mining operations led to a concentration of German patrolling and fighting aircraft.¹ In April 1917

¹ 'Bases for seaplanes were constructed on the North Sea at List (Sylt), Heligoland, Norderney, Borkum, and, in addition to these, at Zeebrugge

an attempt was made to surprise the patrolling Zeppelins. At 5.30 a.m. on the 29th the *Manxman*, with a destroyer screen and a light cruiser escort, arrived north-east of Horn Reefs, but no Zeppelins could be seen and Flight Commander F. J. Rutland therefore flew off in a 'Pup' to patrol an area in which they might be expected. A second pilot who went off later turned back with engine trouble. Flight Commander Rutland did not return and was given up as lost. Admiral Beatty, reporting on the operation, said his opinion was that the weather had been unfavourable for the enterprise, and he laid down guiding principles for future action, the chief of which was that no aeroplane was to be sent up unless a Zeppelin was sighted from the carrier.

Flight Commander Rutland, however, had not been lost. He had, after an uneventful patrol of his allotted area, been hampered by compass trouble and had been unable to find his parent ship. He had eventually come down on the sea a few miles from the Danish coast, where his aeroplane had only been kept afloat by the air-bags for twenty minutes.¹ Not long after the aeroplane had alighted, fishermen had rowed out to the pilot, who swam towards his rescuers, was picked up, and, pleading he had landed outside territorial waters, was ultimately released as a shipwrecked mariner; he rejoined the *Manxman* at the end of May.

During May, June, and July, the *Manxman* continued to co-operate with the mine-laying expeditions to the German Coast, but the German aircraft gave the pilots in the carrier no opportunity for attack. Although these operations produced no positive results, the mere presence of the aircraft carrier afforded protection to the Fleet. An

'and Ostend. Further, the small cruiser *Stuttgart* was fitted as a seaplane carrier, after the necessary experiments had been made on the auxiliary cruiser, *Santa Elena*, and when, as the flying machines were perfected, it seemed desirable not to confine their activities to the coast of the North Sea, but to make use of them at sea as well. This development of flying became necessary, and was encouraged by the urgent need of the mine-sweeping service.' (Scheer, *Germany's High Sea Fleet in the World War*, p. 201.)

¹ After this adventure, new air bags were designed to keep the fighting aeroplanes afloat for five hours.

example of what could, and did, happen when no aircraft were present during operations in the North Sea may be quoted. During a sweep by light cruisers and destroyers on the 4th of May, a Zeppelin (*L. 43*) in company with a number of U-boats, found and attacked the British ships. Three torpedoes were fired at the cruiser *Dublin* while the Zeppelin made a series of determined bombing attacks on the ships. The torpedoes were avoided, and the airship's bombs just failed to score hits, although splinters from them fell in several of the destroyers and in the *Dublin*. When the Zeppelin had exhausted her load, she called, by wireless, for other airships: one subsequently appeared, but no further bombing attacks were made. It should be remarked here that the anti-aircraft armament of the Fleet, especially in the smaller ships, was, at this time, weak.

Flying-boat Successes

The pilots in the carriers had had little luck in their operations against the Zeppelins, but flying-boats, working from East Coast stations, had achieved important successes. Before the war, Commander J. C. Porte, a retired naval officer, had worked in America with the Curtiss Company on the design of a large flying-boat, to be called the 'America', for a flight across the Atlantic. When war came Commander Porte abandoned the enterprise, returned to England, and joined the Royal Naval Air Service. He conferred with the Director of the Air Department and, as a result, two Curtiss flying-boats, with twin ninety horse-power engines, had been ordered by the Admiralty in August 1914 and had been received by November. They were considered experimental, but tests which were made at Felixstowe proved promising and a few more were ordered. As a result of the trials with these early experimental craft an order was given, in March 1915, for fifty flying-boats of similar design, but with engines of slightly higher horse-power. The engine unit—the 100 horse-power Curtiss—in these aircraft was not satisfactory, but when Anzani engines of the same horse-power were substituted, these flying-boats proved useful for training and for limited patrol work.

Before the end of 1915 fifty additional flying-boats of a larger type had been ordered, but when the first one was received in England, in July 1916, it was again found that its Curtiss engines—of 160 horse-power—were unsatisfactory. Modifications of the design were made in this country and two Rolls-Royce engines of 250 horse-power each were substituted. When the bigger craft began to make their appearance, they came to be called '*Large Americas*', and the original flying-boats thereupon became '*Small Americas*'. Officially, the smaller boats used in England were known as the H.4 type, and the larger ones as H.8 (with Curtiss engines) and H.12 (with Rolls-Royce engines). It is with the H.12 type that this narrative will be chiefly concerned. It carried a crew of four—first pilot, second pilot, wireless operator, and engineer—had a speed of about seventy-five knots, was armed with from two to six Lewis guns, according to the duty on which it was engaged, and could, in addition, carry two bombs of 230 lb. weight.

Another development of the original 'America' type was the Porte flying-boat, similar in design, but of larger dimensions than the H.12. An estimate of the size of the first Porte aircraft, unofficially called H.M.S. *Baby*, built early in 1916 and fitted with three engines, may be had from the fact that a Bristol Scout aeroplane was flown from its top plane while the Porte was in flight.¹ Ten of these early-type Porte flying-boats were built, but they proved too slow and too vulnerable for extensive North Sea operations. They did, however, demonstrate the advantages of the large boat-type seaplane in seaworthiness, observation facilities, and in the comfort afforded to the crew—an important feature during patrols of long duration.

Experience with the '*Small Americas*', and with the first boats of the '*Large America*' type, showed that the hull was not satisfactory. The design of the bottom was weak, especially where the tail portion joined the step, and the

¹ The Porte flying-boat, fitted with three 350 horse-power Rolls-Royce engines, carried a crew of five, had a speed of about 80 knots, could climb to 9,000 feet in 50 minutes and could carry a military load of 2,000 lb. Her span was about 120 feet.

pilot had to exercise great care, when taking off or alighting, to avoid the hull breaking. Even in a slight sea the danger of collapse was high, and the result was that it was often impossible to send up the '*Americas*' when flying conditions were otherwise favourable. Another disadvantage of the H.12 type was that her armament proved inadequate. Her guns could not fire immediately below the boat, and the after gun could not be fired towards many points behind the tail of the flying-boat for fear of damage to the tail plane or rudder. Under the direction of Commander Porte, the '*Americas*' were, in fact, largely redesigned. The first experiments, made in 1915 at Felixstowe with the '*Small America*', aimed at the elimination of the weakness in the hull. Eventually a new-type of '*Small America*', known as the F.1. ('F'—Felixstowe), was produced, the first of the famous 'F' boats provided with two shallow steps outside the skin of the main hull which was of pronounced V section throughout its length with a keel line following a smooth curve from stem to stern. Experiments had shown that this V section construction eliminated much of the shock of taking off and landing, and the F-type boats could be used safely in moderately rough water. Furthermore, the tail in the F-boat design was 'cocked-up', and this made it possible to place Lewis guns inside the hull, on the port and starboard sides respectively, to fire through sliding ports just aft of the main planes. The guns were mounted on brackets which could be swung outboard to command wide arcs of fire, meeting not more than twenty feet astern of the boat. The blind spots behind the tail and underneath the H.12 design, although not entirely eliminated, were thus considerably reduced. The large flying-boats produced in 1917 and 1918 with these improvements were known as the F.2a type. They were fitted with two Rolls-Royce engines of 320 horse-power, had a maximum speed of 85 knots and a cruising speed of 60 knots, carried a crew of four, bombs of a total weight of 460 lb., and four Lewis guns, and could attain a ceiling, with full load, of 13,000 feet. At cruising speed the endurance of the F.2a was eight hours, bomb-loaded, or ten hours without bombs, and, at full speed, five and a quarter hours, and six

and a half hours respectively. She had an estimated life, under mooring conditions, of six to eight months. A similar, but larger type, called the F.3, was built in 1918. This type was a little slower (75 knots at full speed), but had a little longer endurance and could carry bombs of a total weight of 920 lb. Her ceiling, however, was only 10,000 feet.

In April 1917 it was decided that the '*Large Americas*' (H.12 type), stationed at Felixstowe and Yarmouth for general North Sea reconnaissance and anti-submarine patrol work, should also be used to attack patrolling Zeppelins in the southern part of the North Sea. Flying-boats later added to the establishment at Killingholme were also employed for the same duties. When it became known from wireless interception reports that one or more Zeppelins were out, the stations were warned and the flying-boats were made ready to take the air at a moment's notice. As the Zeppelin patrolled, her course was methodically plotted by the British wireless interception stations, and if and when she approached within 150 miles of the English Coast her position, course, and speed were communicated at once, by telephone from the Admiralty, direct to one or more of the East Coast flying-boat bases.¹ Then the hunt began. One or more flying-boats, at the discretion of the commanding officers, were sent away. The subsequent positions of the airship or airships were passed on, as they were plotted, to the air stations, whence they were relayed by wireless to the flying-boats already in the air. The receipt of continuous information also enabled commanding officers to judge the need for sending up additional aircraft.

The new organization was put into force on the 26th of April 1917 and success came quickly. Soon after dawn on the 14th of May, in misty weather, news was received of a Zeppelin near the Terschelling Light Vessel. A '*Large America*', manned by Flight Lieutenant C. J. Galpin,

¹ A special squared chart of the southern part of the North Sea, known as *Tracing Z*, was issued to the East Coast air stations for use from the 1st of June 1917. The positions of Zeppelins were communicated by code signals based on the chart.

Flight Sub-Lieutenant R. Leckie, Chief Petty Officer V. F. Whatling, and Air Mechanic J. R. Laycock, was sent out from Yarmouth. When eighty miles had been covered, the flying-boat shut down her wireless to lessen the chances of discovery. Half an hour later, at 4.48 a.m., a Zeppelin was sighted dead ahead ten to fifteen miles away. She was the *L.22*, out on scouting duties in connexion with a proposed exercise by the High Sea Fleet in the Bight on the following day.¹ The Zeppelin was cruising slowly at 3,000 feet, 2,000 feet lower than the flying-boat which proceeded to climb another 1,000 feet. Flight Sub-Lieutenant Leckie, who was piloting, made a skilful approach and dived on the *L.22* until he was twenty feet below and fifty feet to starboard of her gondolas, when Flight-Lieutenant Galpin opened fire from the two Lewis guns in the forward cock-pit. After a burst of fire both guns jammed, and the pilot turned away to give time for the stoppages to be cleared. But no second attack was necessary. As the flying-boat turned, the *L.22* began to glow, and within a few seconds she was falling in flames. Her skeleton plunged upright into the sea, leaving no trace in the dawning light save a mound of black ash on the surface of the water.

A similar success came a month later. On the morning of the 14th of June an *H.12* flying-boat from Felixstowe was off Vlieland, searching for airships, when a Zeppelin came in sight five miles away. She proved to be the *L.43* and she was at 1,500 feet, the same height as the flying-boat, the pilot of which, Flight Sub-Lieutenant B. D. Hobbs, climbed another 500 feet and then dived to attack. Flight Sub-Lieutenant R. F. L. Dickey manned the bow Lewis gun, and the wireless operator, H. M. Davies, and the engineer, A. W. Goody, manned the amidships and stern guns. The flying-boat passed diagonally across the tail of the Zeppelin, and, after a burst of tracer ammunition from the Lewis gun amidships, followed by Brock and Pomeroy incendiary ammunition from the bow gun, the *L.43* caught fire. Three of her crew dropped from her as she went down. The wreckage of

¹ Scheer, *Germany's High Sea Fleet in the World War*, p. 283.

the airship continued to burn some time after she had hit the water.

As a result of these disasters the Zeppelin commanders could no longer take the risk of patrolling at low heights. The same crew who had destroyed the *L.22* had, in June and July, five separate encounters with Zeppelins, but each time the airship was flying high when discovered and escaped by going above the 'ceiling' of the flying-boat (about 12,000 feet). It may be remarked, incidentally, that the flying-boats, by thus forcing the Zeppelins to high altitudes, made it easier for the British submarines, on passage to and from German waters, to escape detection.

So long as the flying-boats had been able to take the Zeppelins by surprise they had had every chance of success, but this condition was now extremely difficult to obtain. Surprise, however, was not of the same importance to pilots of fighting aeroplanes of high performance. If these could be brought within striking range of a Zeppelin, the odds were all in favour of the aeroplanes. Two methods of getting aeroplanes across the North Sea presented themselves. One was to give suitable types an extended fuel capacity so that they would have the endurance for a flight from the East Coast across the North Sea and back without the need to refuel. The other was to convey them across in ships and launch them into the air when the opportunity came. The latter method, recommended by the Grand Fleet Aircraft Committee, was to prove the true solution of the problem, but, meanwhile, the former was tried. Two D.H.4 aeroplanes, equipped to carry extra fuel, were sent to Yarmouth. The intention was to send out one of the aeroplanes, in company with an H.12 flying-boat, when wireless interception reports indicated that Zeppelins were patrolling the Terschelling area. The D.H.4 was to fly high, and the flying-boat was, from a lower altitude, to make a feint attack on any Zeppelin sighted so as to induce the commander to climb, unsuspectingly, within range of the De Havilland. If the aeroplane was forced down on the water the flying-boat would be available to rescue the crew.

At 10.30 a.m. on the 5th of September 1917 one

of the De Havilland's and a flying-boat left to search for a Zeppelin reported near Terschelling. At noon the *L.44* was sighted at 10,000 feet and the attack began according to plan. While the D.H.4 climbed and manœuvred to give the final blow, the flying-boat crew kept up a long-distance duel with the climbing airship. The *L.44*, however, was saved by a defect which developed in the De Havilland's engine. The D.H.4 would not go higher than 14,000 feet and the Zeppelin out-climbed her adversary and escaped. A second airship was sighted, but she, also, put up her nose and disappeared. This was a disappointing end to a well-thought-out scheme which must, but for the engine trouble, have met with success. The two aircraft turned for home, but fifty miles from the English coast the D.H.4's engine failed entirely and the aeroplane crashed. The flying-boat was landed alongside and the pilot and observer were picked up from the wreckage, but a rough sea was running and the overloaded flying-boat, which had a leaking hull due to damage by anti-aircraft gun-fire from hostile destroyers, and an unsatisfactory port engine, would not again take the air. The boat was taxied towards Yarmouth until 7 p.m., when the petrol supply finished. Four pigeons were carried in the flying-boat, now adrift on the North Sea, and these were released with messages at intervals the same evening and during the next day, the 6th, but it was not until after 10 a.m. on the 7th that one of the birds reached its loft at Yarmouth. The flying-boat and its crew were found by the *Halcyon* which took the aircraft in tow.¹

Catapult Experiments

It will not be out of place here to refer briefly to one method for launching aircraft from ships, although no practical use was made of it during the war. The employment of an apparatus for catapult launching had been considered by the Admiralty Air Department before the war in 1914, but the idea had been shelved. In 1917 the question was taken up again and resulted in experiments

¹ For a detailed account the reader may refer to *The Story of a North Sea Air Station*, by C. F. Snowden Gamble, pp. 259-71.

of considerable interest. Three types of apparatus were constructed in which the motive force was, respectively, hydraulic, electric, and compressed air. The hydraulic and electric apparatus was never used, but the compressed air type gave promising results. One apparatus of this type, designed by Mr. R. F. Carey and built by Messrs. Waygood-Otis, was installed at Hendon, and Flight Commander R. E. Penny, a Naval Air Service pilot, volunteered to be catapulted in a modified Avro aeroplane. The experiment was successful and Lieutenant Penny landed without trouble. Another catapult, designed and built by Messrs. Armstrong, and also worked on the compressed air principle, was mounted in a specially commissioned steam hopper, the *Slinger*, and the first experiments were made in the Tyne in September 1917 when an old seaplane, with no personnel aboard, was launched while the *Slinger* was alongside the jetty. The hopper was afterwards sent to the Isle of Grain Experimental Aircraft Depot, where further trials were made, from June 1918 onwards, under the direction of Lieutenant-Colonel H. R. Busteed. In these trials a Fairey type seaplane, specially strengthened, was successfully catapulted from the *Slinger* both when she was at anchor and under way.¹ The apparatus never passed beyond the experimental stage, partly because the view at the time was that it was too cumbersome for installation in fighting ships, and partly because the mounting of launching platforms in cruisers and capital ships made it possible, as shall be told, for aircraft to be flown off under their own power.

Fighter Aeroplanes in Light Cruisers

It will be recalled that one of the recommendations of the Grand Fleet Aircraft Committee was that fighter aeroplanes, for the attack of Zeppelins, should be carried

¹ The launching rail in the *Slinger*, built in the form of a box girder, was about 60 feet long. The trolley which supported the aircraft was impelled along the rails by means of wire ropes, and at the end of its run was stopped by an arresting device. With a very high pressure a velocity of 60 miles per hour could be attained, but the maximum speed used in the trials was about 40 miles per hour.

in certain light cruisers. Experiments to this end had, indeed, been made in the Harwich Force, under the direction of Commodore R. Y. Tyrwhitt, in the autumn of 1915. On the 5th of November 1915 Flight Lieutenant R. J. J. Hope-Vere had succeeded in flying a Deperdussin monoplane from an improvised platform in the light cruiser *Aurora*, but the run required was judged to be too long for practical purposes, and, furthermore, after the monoplane had flown off, it had taken an appreciable time before the foremost 6-inch gun in the *Aurora* could be cleared again for action. There had, therefore, been no immediate further progress.¹

The first light cruiser actually to be fitted was the *Yarmouth*, at Rosyth in 1917. Rear-Admiral R. F. Phillimore, who was generally responsible for all flying experiments at Rosyth and for all questions relating to the Royal Naval Air Service at that base, maintained a close liaison with Wing Captain R. M. Groves, assistant secretary of the Air Board. Captain Groves, an officer of ideas, was one of those who had advocated the use of aeroplanes in ships instead of seaplanes, and, as a result of one of his visits to Rosyth, at the invitation of Rear-Admiral Phillimore, arrangements were made to experiment with aeroplanes in the *Yarmouth*. An extemporized platform was mounted above the conning tower and the forecastle gun to give a run of twenty feet, and, in June 1917, a Sopwith 'Pup' was successfully flown from this platform by Flight Commander F. J. Rutland. On the morning of August the 21st 1917 the *Yarmouth*, carrying her aeroplane, was covering a mine-laying operation off the Danish coast in company with the First Light Cruiser Squadron. A patrolling enemy aeroplane sighted the British ships and made a leisurely reconnaissance lasting forty minutes. At about 5.30 a.m., soon after the German

¹ The Harwich command also made interesting experiments with aircraft and submarines. In April and May 1916 Sopwith 'Schneider Cup' seaplanes were taken to sea on board the *E.22* and were successfully launched and flown back to the air station at Felixstowe. The idea was not further developed chiefly owing to the difficulties of housing aircraft without affecting the submarine's submerging capabilities.

aeroplane retired, a Zeppelin came in view. The British squadron was at the time on a northerly course and this course was held to draw the airship farther away from her base. Soon after 6.30 a.m. the squadron turned westward into the wind and the *Yarmouth* was ordered to fly her Sopwith 'Pup'. The pilot, Flight Sub-Lieutenant B. A. Smart, had not previously flown off the ship, but he got away without mishap and climbed steadily. At 9,000 feet he set course for the Zeppelin, the *L.23*, which had made off rapidly and was ten to fifteen miles distant. When he came within striking distance he was 1,500 feet above her. He dived and attacked until he was within twenty yards of the Zeppelin, when he had to swerve sharply to avoid a collision. By this time the *L.23* had caught fire, and as she fell her framework crumpled and she burned so fiercely on her way down that not much of her remained to hit the sea.¹ Flight Sub-Lieutenant Smart returned to his squadron after an eventful sixty minutes and landed near the *Prince*, by whose boat he was rescued: the aeroplane was lost.²

This success was dramatic in itself, but to appreciate its full significance it will be necessary to consider something of what had passed at a conference, four days earlier, between Admiral Beatty and the Third Sea Lord. At that meeting the Commander-in-Chief had raised, among other questions, the subject of the requirements of the Grand Fleet in aircraft carriers, and he had urged the need for a definite policy saying that, so far as he knew, no naval air policy existed. Arising out of the discussion it had been agreed that one light cruiser in each light cruiser squadron should be fitted with a newly designed, light-weight type of 'flying-off' deck. The ships chosen were, in addition to the *Yarmouth* (Third Light Cruiser Squadron), the *Caledon* (First Light Cruiser Squadron),

¹ A wireless message, 'Pursued by enemy Forces', was sent out from the *L.23* before she fell. As her wireless was thereafter silent, German aircraft were sent to search for her. What they found, in the afternoon, was an oil-patch and a charred propeller blade.

² The usual procedure was for the pilot to land ahead of the nearest destroyer, and when this happened in enemy waters the aeroplane was normally abandoned because a stoppage entailed undue risk from enemy submarine attack.

the *Dublin* (Second Light Cruiser Squadron), the *Cordelia* (Fourth Light Cruiser Squadron), and the *Cassandra* (Sixth Light Cruiser Squadron). It had been further agreed that the *Courageous* and the *Glorious* should be similarly fitted, and that the policy should be extended to other light cruisers 'if found to be very successful and 'desirable'. Immediately following the conference the Admiralty had begun a review of the whole subject of naval air policy and expansion. The achievement of Flight Sub-Lieutenant B. A. Smart, in the *Yarmouth's* aeroplane, exerted a powerful influence on the discussions and on the decisions which were reached.

Deck Landings

Meanwhile, in July 1917, the *Furious*, now converted as an aircraft carrier, had joined the Fleet in Scapa Flow. Thereafter the *Furious*, escorted by destroyers or by a light cruiser squadron with, occasionally, a battle cruiser squadron in support, was employed in sweeps off the Danish Coast and the Heligoland Bight. These sweeps were made at frequent intervals, but so far as the aircraft carrier was concerned they proved unproductive. Either no enemy aircraft were sighted, or, when they were, the weather conditions were such that the German pilots were able to disappear before effective action could be taken against them. During a mine-sweeping operation off the Horn Reefs on the 11th of September 1917, Flight Commander W. S. Moore flew off the deck of the *Furious* in a Sopwith 'Pup' to attack a Zeppelin which had been called to the area by reconnoitring German seaplanes. The British pilot climbed to 10,000 feet, but the Zeppelin took advantage of oncoming clouds and disappeared from view.¹

Although, by the time the *Furious* joined the Fleet, the sending up of aircraft, single-seaters or two-seaters, from the decks of ships was regarded as a fairly simple operation, dependent only on the length of run available and the

¹ It is of interest that soon after the airship was sighted from the *Furious*, a wireless message was received in the ship from the Admiralty in London giving the exact position of the Zeppelin. This had been plotted from bearings obtained through the Directional Wireless Stations in England.

strength of the felt wind, the problem of alighting on deck still awaited practical solution. The introduction of deck landing was much needed in view of the obvious objections to the use of aeroplanes on the high seas if no landing facilities other than the sea were offered them. The chief difficulties in the way of deck landing were two: how to overcome the air disturbances set up by the super-structure of the ship when she was steaming at high speed into the wind, and how to bring the aircraft quickly to rest once it had landed.

The pilots in the *Furious* took up the challenge. They practised, in harbour, by flying slowly beside the ship and then, after passing the mast, by drifting inwards over the centre of the flying deck. These preliminary trials seemed to show that the operation was feasible and, on the 2nd of August 1917, Squadron Commander E. H. Dunning, in a Sopwith 'Pup', made the first successful landing. As the aeroplane drifted over the centre line of the deck, rope toggles hanging from the wing tips, tail skid, and fuselage, were seized by a crew of officers who, at a signal from the pilot as he shut off his engine, hauled the aeroplane down and held it to the deck. This first deck landing, a memorable feat, was successfully repeated, but in a third attempt, made five days after the first, Squadron Commander Dunning fell over the bows of the ship and was killed. As a result of this disaster to one of the most skilful pilots in the service, the tests for landing on the forward deck were abandoned. As an alternative, the proposal was made that the *Furious* should be reconstructed to provide a flying-on deck aft. The captain of the *Furious*, however, was against the proposal. He pointed out that the after guns of the ship would have to be sacrificed and her offensive power consequently lessened, that air currents from the funnels and bridge structure would make landing hazardous, and, finally, that there would be difficulty and delay in moving aircraft from aft to forward. Opinion about the further conversion of the *Furious* was, however, very much divided, and Admiral Beatty considered the matter of such importance that he telegraphed to the Admiralty, on the 12th of September, requesting that expert officers should be sent

from London to confer with the captain of the *Furious*. The question was immediately considered by the Board, who agreed that no decision could be reached about the *Furious* until the whole problem of naval air policy had been settled.

This problem had been raised, as has been told, at the conference between Admiral Beatty and the Third Sea Lord on the 17th of August. On the 20th, in a letter to the Admiralty, the Commander-in-Chief had recurred to the matter: 'A correct policy is of vital moment', he said, 'to our air supremacy at sea during the year 1918. . . . Possibly a definite policy has been decided upon by the staff, assisted by the experts concerned. If this is so, I should be glad if a member of the naval staff visited me and explained the proposals; if no definite policy has yet been formulated, it is urgent the matter should be discussed between the naval staff, the technical experts, and myself at the earliest possible date.' When this letter had been considered at the Admiralty, it was admitted that no definite air policy had been laid down in black and white. Various memoranda on the question were thereupon submitted by the Sea Lords and, on the 25th of August, a preliminary general statement of naval air policy, drawn up by the First Sea Lord, had been sent to the Commander-in-Chief.¹ The matter continued to be debated at the Admiralty, and, ultimately, on the 25th of September, a series of proposals for the expansion of Grand Fleet aircraft were sent to Admiral Beatty for comment. The Admiralty had been greatly influenced by the success achieved by the *Yarmouth's* aeroplane on the 21st of August, and they proposed that as many additional cruisers as possible should be fitted with flying-off platforms. They invited the Commander-in-Chief to state his views on this question; on the fitting of an after landing-deck in the *Furious*; on a proposal to convert the *Glorious* and *Courageous* in the same manner as the *Furious*; and, finally, on the desirability or otherwise of equipping the *Argus* exclusively as a carrier of torpedo aircraft. It so happened that Admiral Beatty had, just before he received

¹ Appendix I.

the Admiralty communication, dispatched a letter which covered much of the same ground. In this letter, which set forth his aircraft requirements for the spring of 1918, he made the important proposal that all Grand Fleet heavier-than-air craft should be of the aeroplane type.

While the matters were still under consideration, the whole outlook was suddenly changed as a result of successes obtained in revolutionary experiments made by Grand Fleet pilots. The great drawback of flying aircraft from ships, whether special carriers or fighting ships, was the need to turn the vessel into the actual wind. The turns which might be necessary before an aeroplane could get away must involve a loss of position of the aircraft-carrying vessel relative to the fleet. Because of this drawback, the fitting of aeroplanes in capital ships had not, hitherto, been approved. Then had come a suggestion from Lieutenant-Commander C. H. B. Gowan, a naval officer who had shown remarkable vision in his conception of the importance and uses of the naval air weapon, and who had been associated with the aircraft experiments in the light cruiser *Yarmouth*, that aeroplanes might be flown from a platform that could be turned into the 'felt' wind while the ship held its desired course. The top of a gun turret was a position readily available, and experiments were conducted in the *Repulse*,¹ under the direction of Captain J. S. Dumaesq, R.N. On 'B' turret of the battle cruiser a sloped platform of 2-inch deals, supported on steel angle bars, was constructed. At the beginning of the run on this platform, the aircraft was placed so that the fuselage was in a horizontal position, and this position was maintained by what was known as a 'tail guide trestle', the tail skid of the aircraft fitting into a grooved runway attached to this trestle; this tail guide was of the kind invented in the *Campania*. The pioneer flight took place on the 1st of October 1917. Opinion, before the flight was made, was divided on the question whether the feat was possible, but Squadron Commander F. J. Rutland took a chance and got away successfully in a Sopwith 'Pup'. The turret was trained 42° on the starboard bow into a 'felt' wind of

¹ The *Repulse* was the flagship of Rear-Admiral R. F. Phillimore.

31½ miles per hour. The platform was subsequently transferred to the after turret, which was trained on a forward bearing, and the same pilot flew off without mishap on the 9th of October.

Thus was solved an outstanding problem of aircraft co-operation in fleet activities. Not only was it demonstrated that small aeroplanes could be flown from a revolving platform on any suitable deck without affecting the course of the vessel, but it had been proved also that the turrets of capital ships could be used without unduly interfering with the turret guns. In qualification, however, it must be pointed out that the aeroplanes could not for long be exposed to the weather conditions on the turret platforms without suffering an impairment, more or less serious, of their flying capabilities, and that flying off the ship was still dependent on the 'true' wind not being abaft the beam. With a strong stern wind the ship would have to turn to make a suitable 'felt' wind.

New Proposals for Fleet Aircraft

The Admiralty proposals already formulated for the expansion of Grand Fleet aircraft were discussed in the light of these turret-flying experiments at a meeting between the Deputy First Sea Lord and the Commander-in-Chief. A memorandum outlining Admiral Beatty's views was drawn up and was discussed by the Operations Committee of the Board of Admiralty.¹ As a result it was decided, on the 17th of October, that:

- (i) All light cruisers and battle cruisers should carry fighting aeroplanes, provided their gun armament was not interfered with.
- (ii) That the *Furious* should be fitted with an after

¹ This Committee had been set up by Sir Eric C. Geddes following his appointment as First Lord on the 6th of September 1917. Its original members were the First Lord, the First Sea Lord (Admiral Sir John R. Jellicoe), the Deputy First Sea Lord (Vice-Admiral Sir Rosslyn E. Wemyss), the Fifth Sea Lord (Commodore Godfrey M. Paine), the Chief of the Naval Staff (Vice-Admiral Sir Henry F. Oliver), the Director of the Anti-Submarine Division (Rear-Admiral A. L. Duff), and a Secretary (Mr. R. F. Dunnell).

landing deck, 300 feet in length, with such modification of the ship's structure as was entailed thereby.

- (iii) That the *Courageous* and *Glorious* should not be fitted in the same manner as the *Furious*, but should remain unaltered.
- (iv) That it was unnecessary at that time to determine whether the *Argus* should be used exclusively as a torpedo-plane carrier.

The fitting of turret platforms in the battle cruisers was begun at once. By the early part of 1918 the *Repulse*, *Renown*, *Australia*, *New Zealand*, *Inflexible*, *Indomitable*, *Tiger*, *Princess Royal*, and the *Lion* had been so fitted, as well as the large light cruisers *Glorious* and *Courageous*. Under the supervision of Captain Dumaresq, R.N., a rotatable platform was designed as a substitute for the fixed flying platforms in the forecastle of light cruisers. A beginning was made with H.M.A.S. *Sydney*, while she was being refitted at Chatham, and the first successful flight from the *Sydney*'s revolving platform was made on the 17th of December 1917. The advantages of the new platform were apparent, and similar ones were fitted in the *Melbourne*, *Birkenhead*, *Southampton*, and *Chatham*. The *Yarmouth* was not modified until June 1918 and the *Dublin* until August 1918.

In those light cruisers which had two superimposed guns in the middle line, the revolving platform, because of interference with the gun-fire, could not be fitted on the fore-castle and was therefore placed instead abaft the funnels.

The success of the *Repulse* experiments, leading as they did to a distribution of aircraft among Grand Fleet vessels, affected all previous estimates of Fleet aircraft requirements for 1918. On the 16th of January 1918 the Operations Committee considered a memorandum drawn up by the First Sea Lord, Admiral Sir Rosslyn Wemyss,¹ and their deliberations were recorded as follows:

1. The Committee approved the broad policy that

¹ Admiral Sir Rosslyn Wemyss had succeeded Admiral Sir John Jellicoe on the 26th of December 1917.

fighter aeroplanes should be carried in fighting ships, and that reconnaissance and torpedo planes should be carried only in special carriers, but that this should not prevent a few additional fighters being carried in seaplane carriers or special carriers when necessary.

2. The Committee agreed that it was desirable that *Pegasus* should be forthwith altered to carry fighters, and should she prove entirely satisfactory, that *Nairana* should be taken in hand for the same purpose.¹
3. The Committee decided to retain *Campania* for training purposes, and to postpone consideration as to whether she should be fitted with a flying-on deck until after experience had been gained with the *Argus* and *Cavendish*.
4. The Committee also considered a proposal that the Chilean battleship, *Almirante Cochrane*, then building at Elswick, should be converted into an aircraft carrier. The Committee were of opinion that it was desirable to carry out this proposed conversion, provided it could be done without excessive sacrifice in other directions, and it was decided to ask the Maintenance Committee to indicate what dislocation of other work would be entailed if the proposal were adopted, and also to what extent its adoption would affect the position as regards the Fleet aircraft carrier *Hermes*.²

The Committee also considered a project of Sir David Beatty for an air offensive, early in 1918, by the Grand Fleet against German bases and ships in harbour. This proposal had been made as a result of the production of the new torpedo-carrying aeroplane fostered by Commodore Murray Sueter, the Sopwith single-seater 'Cuckoo', which

¹ That is to say, fighting aeroplanes exclusively. At the time the *Pegasus* carried five fighting aeroplanes forward, and four two-seater seaplanes in the after hangar. The *Nairana* carried four fighting aeroplanes forward and four two-seater seaplanes aft. Owing to difficulties of reconstruction, however, this proposal was not followed up.

² The *Almirante Cochrane* was taken over for conversion and, renamed the *Eagle*, was launched in June 1918: she was not, however, completed at the date of the Armistice.

had been tried out successfully at the Isle of Grain in July 1917. Fitted with a 200 horse-power Hispano-Suiza engine, the 'Cuckoo', carrying a 1,000-lb. torpedo, could, in twenty-five minutes, reach 10,000 feet, at which height her speed was 87 knots. After the trials, orders for 100 'Cuckoos', to be fitted with 200 horse-power Sunbeam Arab engines, had been placed.¹ Sir David Beatty had asked for 200 of these torpedo-aircraft for an offensive operation against the High Sea Fleet. The Operations Division at the Admiralty had submitted a similar scheme. The view of the Committee, however, was that the results obtained by the persistent heavy bombing operations made by the naval air units at Dunkirk were not such as to encourage an air offensive against German bases by aircraft from carriers. It was clear that an offensive of the kind contemplated must, to be effective, be continuous, and the Committee were of the opinion that, even assuming carriers and aircraft would be available, repeated operations from carriers were not feasible because each expedition would require to be worked out in detail and would involve a large protective force of fighting ships which must incur great risks.

The arguments against bombing and torpedo operations, as set out by the Operations Committee, are open to comment. Every expedition to German waters had to be worked out in detail, and a protective force of fighting ships had been provided time and again. Furthermore, the Dunkirk air command had had no torpedo aircraft at its disposal, and the lessons to be learned from the sporadic bombing of small targets were not particularly applicable to attacks by torpedo aircraft on the German High Sea Fleet concentrated in its harbours. However, in the result, the Admiralty, after prolonged deliberation, decided that all idea of an air offensive, by Grand Fleet aircraft, on German bases and ships in harbour, must be abandoned, and Sir David Beatty was so informed.

Meanwhile an important decision, affecting the control

¹ Additional orders placed from time to time in 1918 brought the total number to 350. Deliveries, however, did not begin until June 1918, and ninety only had been taken into service by the time of the Armistice.

of Grand Fleet aircraft, had been taken. In November 1917 the Commander-in-Chief had urged a centralized control for the air-service units in his command, and had proposed the appointment of a Flag Officer to act as his adviser and deputy and to take full administrative control of all aircraft working with the Fleet. The Rear-Admiral for Air should, he suggested, hoist his flag in the *Furious*. The Admiralty agreed and, at the beginning of January 1918, the new appointment was given to Rear-Admiral R. F. Phillimore, Commanding the First Battle Cruiser Squadron and flying his flag in the *Repulse*. He was made responsible for all Fleet aircraft carriers and for the shore air bases of the Fleet at Donibristle, Rosyth, Smoo-groo, Scapa, and (later) Turnhouse. This appointment of an 'admiral of the air' was overdue. The Commander-in-Chief of the Grand Fleet had, henceforward, one officer generally responsible for all matters concerning Fleet heavier-than-air craft, and for the Fleet air bases ashore, and the position was thus brought into line, in many respects, with that of the General Officer Commanding the Royal Flying Corps in France, *vis-à-vis* Sir Douglas Haig.

It will be recalled that the Operations Committee in October 1917 had directed that the *Furious* should be fitted with an after landing-deck. In March 1918 the structural alterations to the carrier had been completed, and she rejoined the Grand Fleet and became the flagship of Rear-Admiral R. F. Phillimore. She now had a landing-deck, 284 feet by 70 feet, extending from the funnel to near the after end of the ship, on the same level as the flying-off deck forward and connected with it by gangways. An additional hangar to house six aircraft had been added, as well as lifts and extra workshops. These alterations had compelled an important modification of the armament in the *Furious*. The remaining 18-inch gun had gone and the number of 5.5-inch guns had been reduced from eleven to ten. She now carried fourteen Sopwith two-seater reconnaissance aeroplanes (1½ Strutters) and two Sopwith single-seater 'Pups'. This was in accordance with the policy laid down by the Operations Committee in January 1918 that reconnaissance aircraft should mainly be employed from aircraft

carriers and that fighting aircraft should be carried in fighting ships. The number of aeroplanes in the *Furious*, however, was not constant. Changes were also made from time to time in the proportion of two-seaters and fighters, and, for special operations, as many as twenty-five aeroplanes (fourteen of them folding single-seaters) were carried.

The landing-deck in the carrier was fitted with an arresting gear consisting of longitudinal wire cables nine inches above the deck and anchored at each end.¹ At the forward end of the deck a wooden ramp was fitted under the wires. Across the wires at wide intervals ropes were laid. When the aeroplane landed, a hook under the fuselage engaged the ropes, which were weighted with sand-bags at each end, and so the forward movement of the aircraft was retarded. Small V-shaped hooks, attached to the undercarriage, engaged in the wires, and as the aircraft ran up the ramp the friction of the wires in the hooks increased until the aircraft was brought to a standstill. As a final precaution, to prevent an aeroplane crashing into the funnel casing and superstructure, there was a buffer screen of manilla hawsers stretched at the forward end of the deck. In order to decelerate the landing run still further, the aeroplanes in the *Furious* were fitted with skid undercarriages in place of the usual wheel type.

These landing arrangements had been proved satisfactory by experiments ashore at the Isle of Grain, but it soon came to be realized that the design of the landing-deck itself was wrong. Pilots were dubious about the mass of structure in front of the deck which would, they suggested, set up disturbed air conditions, while it appeared that the disturbance would be accentuated by the efflux of hot gases from the funnel. When landings came to be attempted their views were proved correct. The aeroplanes were bumped and buffeted; one pilot made many attempts, but could not get into position for

¹ This gear had resulted from experiments carried out by Squadron Commander H. R. Busteed at the Experimental Construction Depot, Isle of Grain, where a flat, circular, wooden platform had been built flush with the ground.

landing, another was bumped on the deck and pitched against the buffer net, and a third (Squadron Commander F. J. Rutland) fell over the side and narrowly escaped with his life. After further landing attempts at various times, of which all except three ended in crashes, it was decided that landing on this deck was impracticable. Captain Nicholson, R.N., of the *Furious*, reported that in future carriers the funnels and bridge should be formed aft, or else on the side of the ship, so as to give landing aeroplanes 'clean' air, and Rear-Admiral R. F. Phillimore strongly supported these views. Meanwhile the *Furious* continued to take part in periodical sweeps off the Danish Coast and into the Heligoland Bight. Aeroplanes were occasionally flown off the deck to make reconnaissance flights, but on their return they were landed in the sea ahead of one of the screening destroyers which picked up the aeroplane's crew.

The unsatisfactory nature of the landing-deck in the *Furious* led to changes in the design of the *Argus* which had been launched in December 1917. The *Argus* embodied many unusual features, and was, indeed, a wonder-ship of her day. Chief credit for her design must be accorded to Commander Gerard R. A. Holmes, whose proposal for the construction of a seaplane-carrying cruiser, submitted to the Admiralty in August 1915, had, it will be recalled, been rejected. This officer acted as a liaison officer between the Air Department and the Director of Naval Construction. His original design for the *Argus* allowed for a flush upper deck without obstruction of any sort, and the plan for turning the funnels into horizontal ducts, an important innovation, was his. Before the *Argus* had been completed, however, modifications in her design had led to some obstruction of her flying-deck, which was cumbered with bridge-houses. But the *Furious* experiments had confirmed the prudence of the original designs for the *Argus*, and, as a result, it was decided that the upper part of the *Argus* should be redesigned so as to remove the bridge-houses and provide an absolutely clear flying-deck. This decision involved a reconstruction of the whole of the navigating and wireless arrangements, and of

the deck cabins, and also the abolition of the cranes at the ends of the bridge-houses. The reconstruction was, in fact, of a drastic kind, and the *Argus* was not ready for her steam trials until September 1918, so that she took no part in the war.

The task of providing clear deck space in the *Almirante Cochrane*, which was being converted as the *Eagle*, presented many difficulties. The various proposals which were put forward involved the grave objection that they provided for the discharge of the hot gases at a low level in the region of the middle of the length of the ship. It appeared, also, to be impracticable to carry the funnels aft under the upper deck as in the *Argus*. Mr. J. H. Narbeth, the Assistant Director of Naval Construction, thereupon devised a scheme for fitting the funnels through an island on the starboard side of the ship.¹ Models were made and experimented with in the wind tunnels at Teddington, and, ultimately, the 'one island' system was adopted in the *Eagle*. Before placing the island on the starboard side, Mr. Narbeth consulted many pilots who all told him that if they decided not to land after they had approached very near the ship they would turn away again to the left. The demand of the air service for a clear deck space, however, remained strong, and in the general reconstruction of the *Furious* a clear deck was provided in the design.² Post-war experience at sea with the *Eagle* and the *Furious* led to a revision of opinion about the merits of the clear deck of the *Furious*, and an island was again provided on the starboard side in the *Glorious* and *Courageous*, as it was also in the *Hermes*.

¹ Mr. Narbeth worked towards this solution independently. It will, however, be recalled that a similar suggestion had been made by Captain Wilmot Nicholson. As a fact, also, a proposal that the bridge, mast, and funnels of future aircraft carriers should be enclosed in a stream-lined casing at one side of the ship, had been put forward by Flight Commander H. A. Williamson in 1915.

² The reconstruction of the *Furious* as a clear-deck aircraft carrier involved great technical difficulties. Mr. Narbeth was responsible, under Sir Eustace H. W. Tennyson-D'Eyncourt, the Director of Naval Construction, and in close association with Mr. C. J. W. Hopkins of the Royal Corps of Naval Constructors, for the redesign of the ship.

The success of flying single-seater fighters from the turrets of capital ships had been so pronounced that trials were made with two-seater reconnaissance aircraft. The turret platform in the *Repulse* was extended, but an attempt in a Sopwith 1½ Strutter in March 1918 failed. Trials were then transferred to H.M.A.S. *Australia*, where a bigger platform was built, and on the 4th of April 1918, Captain F. M. Fox, R.A.F., in a Sopwith, carrying an observer and full wireless equipment, made the first flight in a two-seater from a British warship. As a result it was decided to fit the forward turrets of all battle cruisers with extended platforms for two-seater aeroplanes; the after turrets were to carry the single-seater fighters.

Kite Balloons with the Fleet

Side by side with these revolutionary changes in the organization and distribution of the Fleet's heavier-than-air craft, there had been a marked development in the airship and balloon services. In May 1917 Vice-Admiral Sir John M. de Robeck, commanding the Second Battle Squadron, became the central authority for all matters relating to kite balloons for the Grand Fleet. Exercises in July 1917, during which balloons flown from ships were sighted by the 'opposing' fleet long before the ships themselves came in view, led to a lively controversy. It was claimed by the opponents of the balloon that it not only revealed the presence of the ships, but also gave clues to the composition of the fleet and to its alterations of course. Sir David Beatty, summing up the controversy in a report to the Admiralty, stated that the consensus of opinion, with which he concurred, was that the functions of the balloons were sufficiently promising to warrant their retention. They were wanted in the advanced line for reconnaissance, and although they might be seen by the enemy, the value of the information which the balloon observers could give would far outweigh the disadvantage of disclosing the presence of the British ships. Balloons would also, when experience had been gained, have a further value as spotting media for the guns of the Battle Fleet.

It was thereupon laid down that four light cruisers (*Calliope*, *Caledon*, *Birmingham*, and *Chester*), two large light cruisers, two battle cruisers, nine battleships, and three destroyers, should be fitted with winches for the towing of balloons. This was additional to what was required for the anti-submarine units organized in July 1917, each consisting of six destroyers of which four were to carry balloons. The work of these units—known as Destroyer Kite Balloon forces—will be considered in a subsequent chapter. The *Campania*, it was decided, would not fly her balloons on service, but would keep two balloons ready for transfer, as required, to ships of the Grand Fleet. The *Canning*¹ was also to keep two or three balloons ready and inflated, except in winter.

When the balloons were required for service at sea, they were taken off the *Canning*, the *Campania*, and from the shore bases, in steam drifters, and were then transferred to the battleships, cruisers, and destroyers which were to tow them. Those who saw the Fleet put to sea with balloons have testified that the sight was a somewhat remarkable one.

The controversy on the danger of flying kite balloons from a fleet at sea was revived as a result of further Grand Fleet exercises in February 1918, when, once again, the balloons were sighted long before the ships became visible. It was argued that bearings taken on the balloons would enable torpedo attacks to be developed with ease and safety against the fleet which was flying them. Opinion was sharply divided, and continued to be divided up to the end of the war. The balloons were, however, retained, and at the date of the Armistice in November 1918, eighteen battleships, three battle cruisers, and seven light cruisers, in addition to a large number of smaller anti-submarine craft, had been fitted for towing balloons. A disadvantage of the balloons was that, in squally weather, they were liable to break away, and a number were, in fact, lost from this cause. This weakness tended to affect the use of balloons in the faster ships of the Fleet.

¹ The *Canning*, after service in the Mediterranean, had been recommissioned in December 1916 as a harbour depot ship for the Grand Fleet.

Airships

The first airship of the 'North Sea', or N.S. type, originally designed for patrols of a minimum of twenty hours' duration, underwent trials in February 1917.¹ Her trial speed was 44 knots. This *N.S.1* went to the air station at Pulham, whence, in June 1917, she made a flight of 49½ hours' duration, in which she covered 1,500 miles. Six North Sea ships were completed in 1917. In July 1917, when it became known that German U-boats operating off the north-east coast were using a track running roughly north-east from Coquet Island, it was decided to concentrate 'North Sea' type airships at East Fortune where they would be available for patrols along this U-boat track as well as for fleet reconnaissance. The *N.S.3* was flown to East Fortune on the 22nd of July, the *N.S.1* in September, and the *N.S.4* in October. The N.S. ships, however, proved disappointing, chiefly because much trouble was experienced with the power transmission gear. Their patrols had to be curtailed, and they could not, as had been hoped, be relied upon for use with the Fleet.² This N.S. airship disappointment calls for some comment. The design for the original airship was, in fact, very far ahead of that of any previous airship. The main aim was to give the ship endurance, and, to achieve this, many radical developments in the design had to be made. The trials of the first ship, in February 1917, were very satisfactory, and so anxious was the Admiralty to get this new airship to a patrol station, that she was sent away from

¹ The envelope was a stream-lined *Astra* of 360,000 cubic feet capacity, rigged to an enclosed car of wood with steel-bracings and covered with duralumin sheets. The engines were two 250 horse-power Rolls-Royce.

² The *N.S.2* was wrecked at Stowmarket in a trial flight; the *N.S.5*, on her way to East Fortune in December, was forced to land with engine failure and had to be deflated by ripping; the *N.S.6*, completed in December 1917, was retained at Kingsnorth for the fitting of Fiat engines with a direct drive instead of the machinery and transmission gear provided in the original design. She was ready in May 1918, and went to Longside, near Peterhead. The *N.S.1* on December 15th 1917, forced down by engine failure, had to be deflated by ripping.

Of thirty-seven non-rigid airships of all types lost or deflated owing to accidents in 1917, sixteen were as the result of engine failure.

Kingsnorth to Pulham, in spite of the wish of those who had designed and built her that she should be kept back for further extensive trials at full speed. The trouble with the transmission gear was not disclosed until the ship had flown for some 200 hours, and by that time the construction of the other N.S. ships had progressed so far that only minor changes were possible. The lesson of this experience, and one especially applicable to airships, is that a new type, particularly when the design is a radical advance on anything previously attempted, should undergo drastic and exhaustive trials before being subjected to the rigours of active service.

Nor did the performance of the rigid airships, the development of which had been taken in hand too late, come up to expectations. The original ship, *R.9*, was completed by Messrs. Vickers in March 1917, and was sent, next month, to Howden, where she was used mainly as a training-ship. Three ships of the *R. 23* Class were also completed during the year; they were *R.23* by Messrs. Vickers at Barrow, *R.24* by Messrs. Beardmore at Inchinnan, and *R.25* by Messrs. Armstrong-Whitworth at Barlow. The *R.23* was accepted after trial flights made on the 15th of September 1917, and was sent to Pulham: her speed was approximately 52 miles per hour. The *R.25* was delivered on the 15th of October and went to Howden, and the *R.24* flew to East Fortune on the 28th of the same month. The lift of these ships was disappointing, and modifications in the design were suggested for incorporation in the *R.26*, the remaining ship of this class. The three ships which had been delivered were used occasionally for escorting convoys, but chiefly, owing to their unsatisfactory performance, they were retained for instruction and experiment.

The Grand Fleet, therefore, had still to rely, for such co-operation as airships could afford, on ships of the 'Coastal' type, working chiefly from the bases at Longside and East Fortune. Both these bases, during 1917, had an undue amount of fog and squally weather, and the airship operations were strictly limited. Under the best conditions, however, the radius of action of the 'Coastals'

was insufficient for really useful fleet work and, from March 1917, further trials were made of towing airships from light cruisers. The trials by day, when the airship was towed, refuelled, and given a change of crew, and by night, when it was picked up and towed, were successful, but they made it clear that a towed airship was difficult to control and that the consequent strain on the airship crew was high. It was therefore decided that when 'Coastals' were required for work in co-operation with the fleet, they should be flown out and taken in tow for refuelling as necessary, but that towing for other reasons should not be undertaken.

In a Grand Fleet exercise in July 1917 five 'Coastal' airships were employed, and from them some valuable reconnaissances were made. On this occasion an attempt to refuel the *C.15* from the *Phaeton* failed, and the airship had eventually to be ripped. Other exercises in September 1917 again showed the great value of airship reconnaissance to the Fleet, but they confirmed that the non-rigid ships had neither the strength nor the endurance to make them a reliable reconnaissance medium in the weather conditions which the Fleet must expect in the North Sea during the greater part of the year. The development, however, of the aeroplane for work with the Fleet at sea, and of the flying-boat for distant North Sea reconnaissances, made the problem of airship and fleet co-operation less urgent and important. The main work of the 'Coastals' and other non-rigid airships was patrol in search of U-boats and minefields and the escort of convoys along the various war channels, a work for which they were well fitted and one which they splendidly performed.

It was said, at the beginning of this narrative, that in the year 1917 there were important developments in all branches of naval air work. It may help the reader to appreciate better how remarkable some of those developments were if we summarize the progress made with heavier-than-air craft for the Fleet, and survey the position as it appeared about March 1918. It will be recalled that when the Grand Fleet Aircraft Committee reported at the

beginning of February 1917, the Fleet disposed only of three carriers, the *Campania*, *Engadine*, and *Manxman*, and that, except the *Manxman*, which carried aeroplanes as well as seaplanes, they were equipped with seaplanes. But these carriers, few as they were, were of doubtful value. The *Engadine* could only be counted upon when the sea was fairly smooth, and the North Sea is not often smooth. The speed of the *Manxman* was low and her radius of action restricted. Sir David Beatty had pointed out, in a letter to the Admiralty on the 21st of January 1917, that the German Fleet possessed a powerful aid to reconnaissance in their Zeppelins, and that if the High Sea Fleet came out of harbour for operations, it could be taken for granted that weather would be chosen suitable for flying by Zeppelins and seaplanes. He had proceeded to stress how important it was that the Grand Fleet should also be in a position to make full and proper use of the air weapon.

By March 1918 the position had changed entirely. For air reconnaissance the Grand Fleet now possessed the speedy carriers *Furious*, *Pegasus*, and *Nairana*. The *Campania* had mainly been given over to training, and the *Manxman* and the *Engadine* had been sent to the Mediterranean. Special land air bases for the Fleet had been established at Houton Bay in the Orkneys, at Rosyth, Donibristle, and at Turnhouse. But the provision of new carriers was not the most important development. Fighting aircraft were now carried in many fighting ships, that is in battle cruisers and in light cruisers. Most revolutionary of all, the aircraft for fleet work was no longer the seaplane, but the aeroplane, which could take off from the deck of the carriers and could also be flown from the turrets of the fighting ships without those ships being required to leave the line, or alter course. In the early part of 1917 the Grand Fleet had had no reliable assurance that it might not be reconnoitred and attacked, with impunity, by Zeppelins and by German seaplanes. It had had to face the possibility that Zeppelin reconnaissance might give such early information about the disposition, course, and speed of the Grand Fleet, as to enable German mine-layers to act in the path of the ships without any knowledge of the

mine-laying activities reaching the British Commander-in-Chief. In March 1918 it may be said that any Zeppelin which came within sight of the Grand Fleet would have run such risk of attack from fighting aeroplanes as to make her survival highly doubtful, and certainly that no Zeppelin could have remained in contact with the Fleet for long enough to permit of useful reconnaissance. Nor could enemy seaplanes hope to do what was now beyond the capabilities of the Zeppelins. No seaplane in the German service, or for that matter in any other, was a match for the 'Camel' fighting aeroplane with which the British battle cruisers and light cruisers were equipped in March 1918. New carriers, which were to become known after the war, were already under construction. In the same period the flying-boat had been greatly developed and had had some spectacular successes, not only against Zeppelins, but also against U-boats. Although, with the passing of the element of surprise, these successes might not be easily repeated, the flying-boat remained an important medium for reconnaissance, particularly of the mined areas in the southern part of the North Sea. In a word, the British Fleet possessed in March 1918 the means for the attainment of air superiority in any possible naval operations in any part of the North Sea, except within effective range of adequate German fighting aircraft operating from shore bases.

CHAPTER II

UNRESTRICTED U-BOAT WARFARE

[Map facing p. 1]

THE German submarine threat had, by the end of 1916, brought about changes at the Admiralty. In December, as has been told, the Anti-Submarine Division had been created, under Rear-Admiral A. L. Duff, for the control and co-ordination of all the British anti-submarine forces, and from this time dates a wide expansion in the naval air organization. The officers of the new Anti-Submarine Division made an early survey of the whole position and concluded that the decisive theatre of operations would be the western approaches to the British Isles where the oceanic routes converged and where there could be no defence by dispersion. In this danger area, which was too big for efficient patrolling, U-boats had, in the later months of 1916, inflicted increasing losses on Allied shipping.

At the time the Anti-Submarine Division was formed, traffic round the British Isles was controlled by a set of orders which aimed at keeping vessels inside the coastal zones, and had the general effect of concentrating great numbers of ships along the patrol routes off the south coast of Ireland and in the Bristol Channel. But the majority of the naval air stations were on the East Coast, where air patrol of the shipping routes was a routine procedure. Except the airship stations at Mullion and Pembroke, there were no bases from which aircraft patrols could be organized for the western channel.

In the middle of December 1916, Rear-Admiral Duff, in a memorandum to the First Sea Lord (Admiral Jellicoe), asked that the Director of Air Services should be requested to prepare a scheme for the development of additional air patrols on the following basis:

Suggested Base.

- (i) Falmouth or the Scillies.

Patrol.

North of Cornwall up to Lundy Island: westwards from the Scillies: northern traffic route up Channel.

<i>Suggested Base.</i>	<i>Patrol.</i>
(ii) Queenstown.	South coast of Ireland.
(iii) Milford Haven.	To Lundy Island and to Tuskar Light.
(iv) Salcombe (Start Point).	Up and down traffic route.
(v) Berehaven.	South-west coast and ap- proaches to west of Ireland.

In his memorandum Rear-Admiral Duff stated that experience seemed to show that for anti-submarine operations, seaplanes, supplemented by aeroplanes, should be used offensively, and that airships should be confined to reporting and keeping watch on U-boats and to giving warnings to divert shipping. Kite balloons, he suggested, might be used from sloops or other special anti-submarine patrol vessels. The First Sea Lord generally approved this outline of policy and development, but considered that airships should be used offensively as well as defensively, and that, for inshore work, aeroplanes, because of their greater bomb-carrying capacity, would probably prove more effective than seaplanes.

A search was thereupon made for suitable seaplane bases. From Torquay to Land's End it was difficult to find sites offering the necessary shelter, but ultimately two were acquired at Cattewater (Plymouth) and Newlyn (Land's End). The waters off the north-west coast of Cornwall and west of the Fastnet were reported unsuitable for seaplanes, and the patrol of these waters was therefore to be undertaken by airships from Mullion and Pembroke. An additional shed to house a 'Coastal' airship was transferred from Dover to Mullion. The Vice-Admiral Commanding Queenstown was decidedly lukewarm about aircraft co-operation, chiefly because no sloops could be spared to leave their patrols to attack a submarine if and when one was reported by aircraft, or to rescue a seaplane down on the water from engine trouble or other cause. 'If the 'sloops have to look after them,' he said, 'to rescue or to 'mother them, then the seaplanes will be a hindrance and 'a serious nuisance; the patrol routes will be dislocated,

'and the submarines will be able to reap a rich harvest 'during the absence of the sloops. If seaplanes are not 'wanted elsewhere, and can look after themselves, they 'will be useful. If not, they will be an offence.' This represents an attitude of mind with which the naval air personnel had often to contend, but it must in fairness be stated that it was founded on experience with some of the earlier and less reliable types of aircraft. Perhaps the best commentary on this outlook of a distinguished naval commander lies in the fact, as shall be given in detail later, that of four U-boats sunk in the month of July 1917 as a result of the full and combined anti-submarine measures of the navy, two were destroyed by aircraft unaided, and a third chiefly through the agency of a kite balloon. Because of the views expressed by the Vice-Admiral the proposal to form additional seaplane bases at Queenstown and Berehaven was left in abeyance and instead a base was ultimately opened at Fishguard. In February 1917, as a result of the increase in the U-boat successes off the Scillies, three H.12 type flying-boats were flown from Felixstowe to the Scilly Islands for anti-submarine operations from moored positions in a sheltered bay.

When the German campaign of unrestricted U-boat warfare began on the 1st of February 1917, it was marked by a change of tactics from surface attack by gun-fire to submerged attack with torpedo. At the time the new campaign began 111 U-boats were available. Of these forty-nine were based at North German ports, thirty-three at Zeebrugge and Ostend, twenty-four at Pola in the Adriatic, two at Constantinople, and three in the Baltic. No more than forty U-boats could be expected to operate at the same time. In the first week of February thirty-five vessels were sunk in the Channel and the western approaches. In March the attacks were intensified and it was known that at least eight submarines were operating at one time between the Channel and western Ireland.

The existing air patrols proved inadequate, and as there were no seaplanes available by which the patrols might be increased, aeroplane stations were opened in April at Prawle Point (Salcombe), Mullion, and Pembroke. Each

station began with four Sopwith $1\frac{1}{2}$ Strutters.¹ On the 3rd of April all the air stations in the South-Western Group (Cattewater, Scilly Isles, Newlyn, Fishguard, Mullion, and Pembroke) were made a separate command under Wing Commander E. L. Gerrard, with head-quarters at Devonport.² The Group was under the general orders of the Naval Commander-in-Chief, Plymouth. Systems of routine patrols by seaplanes, airships, and aeroplanes were established by which the main vulnerable area was covered, and aeroplanes or seaplanes were also kept ready for emergency patrols on receipt of specific information.³ Special seaplane patrols, styled 'Contact-Patrols', in co-operation with destroyers or motor launches, were also organized when it was desired to search definite areas some distance from the land. The normal patrol of this type enabled 1,600 square miles of sea to be systematically searched.

The mid-Channel patrols were organized with seaplanes of the Portsmouth Group air stations under Wing Commander A. W. Bigsworth. In January 1917 this Group, which operated under the orders of the Naval Commander-in-Chief, Portsmouth, comprised the main air station at Calshot, and sub-stations at Bembridge (Isle of Wight) and Portland. In May there was added a new sub-station at Newhaven, and, in July, another at Cherbourg. In the latter month, also, the airship station at Polegate was taken over by the Portsmouth Group from the Vice-Admiral, Dover.

While these air patrols were being developed in the Channel and south-western approaches, the waters off the East Coast, from the North Foreland to the north of Scotland, were divided (in March 1917) into seven patrol areas to be searched by the seaplanes of the various

¹ In August 1917 the aeroplane units had to be disbanded because of a shortage of pilots resulting from the necessity of bringing up to strength the R.N.A.S. squadrons attached to the Royal Flying Corps in France.

² In November 1917 Fishguard and Pembroke were separated from the South-Western Group and formed a new Group under the Senior Naval Officer, Milford Haven.

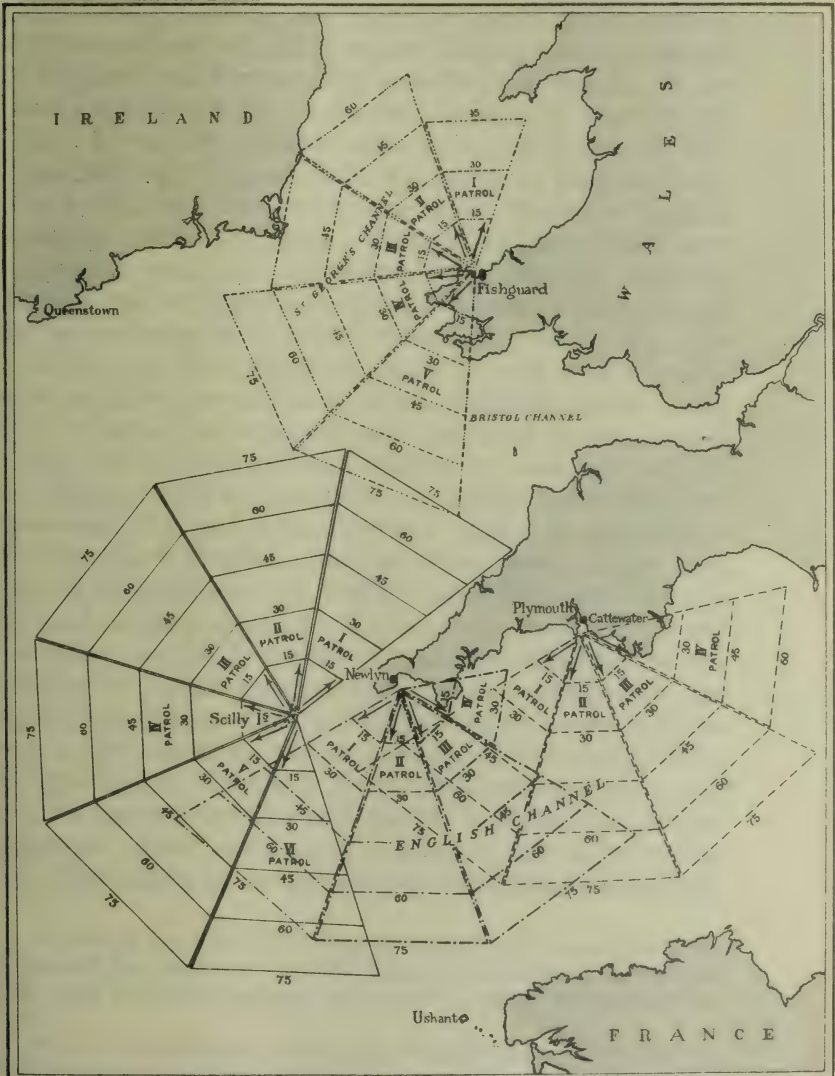
³ An example of a scheme of seaplane patrols introduced in July 1917 for the South-Western Group of air stations is given in the map facing.

SEAPLANE AND FLYING-BOAT PATROLS

SOUTH-WESTERN GROUP OF AIR STATIONS

SERIES II. JULY, 1917.

The numbers indicate the length, in sea miles, of the long side of each triangle. For a search in the direction of the arrows the code letter a was used, against the arrows, b. Example. The order Routine II a 45 to any station called for a patrol of the triangle numbered 45, in the patrol sector II, to be made in the direction of the arrows. If a more intensive search was desired, the seaplane would cross, and re-cross, the big triangle at each intermediate base on its outward flight, but would normally return direct. The order would then read Routine II a 15. 30. 45.



commands. Hitherto no limits had been prescribed for searching operations by the seaplanes, and there had been, in consequence, both overlapping and discontinuity.

In the anti-submarine campaign the detective work of the Naval Intelligence Division played a notable part.¹ The U-boat commanders were, like their colleagues in the naval airship service, free with the use of their wireless, and listening ears at the direction-finding wireless stations in England and France duly recorded the signals. It was then a simple matter to fix the positions of the German craft. It will be recalled that when, in a similar way, Zeppelins were located, each was given an English Christian name, and its movements were thereafter plotted under its temporary name. Units in England which were concerned with the operations of Zeppelins received, through the intelligence stations, a stream of messages telling of the progress of *Anna*, *Bertha*, or *Clara*, and they were able, on their charts or maps, to plot with tolerable accuracy the movements of each individual airship. Each U-boat, when first reported, was identified by the name of a fish, for example, *Plaice*, *Roach*, or *Salmon*,² and the intelligence staff endeavoured to follow the subsequent movements of each separate craft. Apart from information obtained through wireless interception, there were reports of sightings and attacks by British and French air and surface craft to be studied, and there was the check on the U-boats' movements supplied by the sinkings of Allied vessels. Some of the submarines had regular rest billets where, in shallow water (twenty fathoms or so), they could lie on the bottom between their tours of depredation. All likely places were methodically noted and the movements of the U-boats, as plotted on the intelligence charts, sometimes indicated that a particular rest billet might be in use, and led to an immediate hunt.

¹ Admiral of the Fleet Sir Arthur K. Wilson, V.C., who had retired, volunteered his services to the Admiralty on the outbreak of war and spent much of his time tracking and forecasting enemy submarine movements.

² With the submarines, as with the Zeppelins, names were allotted alphabetically in the order in which the enemy craft were first reported.

This unrelenting warfare of detection was of enormous help, at all times, in defining the likeliest areas of search for the hunting craft, and, on occasion, led to the swift destruction of a U-boat. It was some time, however, before it was realized that the naval air stations had the best chances of success in their campaign against the submarine if intelligence about U-boats was received without delay, and it was not until May 1917 that orders were issued that all reports of U-boat movements were to be communicated direct to air stations in a position to take action. In July, to make the passing of such messages easier, and to maintain secrecy, a special form of squared chart, called *Tracing U* (*Unterseeboot*), to cover the North Sea east of a line running from Flamborough Head to the Straits of Dover, was issued to the East Coast air stations required to take anti-submarine action. It was then arranged that the positions of U-boats as determined by directional wireless would be plotted at the Admiralty and passed immediately to the air stations according to the code of the squared chart.

It was always difficult to distinguish from the air between the different types of enemy submarine and, what was more serious, it was sometimes impossible to decide whether an under-water craft was enemy or friendly. British submarines were, unhappily, sometimes attacked by Allied aircraft. Recognition signals for submarines had continuously been investigated from the beginning of the war, but one which would be both practical and effective was not easy to devise. British submarines at first used a water jet to establish their identity when challenged, but this proved an unsatisfactory method and was soon abolished. In areas where German aircraft were unlikely to operate, British submarines had identification marks painted on their decks, but in some conditions of light, if the decks were wet and the paint at all dirty, the marks could not be seen from the air. Dependence on a visual signal from a submarine in answer to a challenge from aircraft was dangerous. If a submarine was ready to dive, there would be no one on deck to make a signal, and failure to elicit a reply would be assumed by the aircraft

crew to indicate an enemy vessel. To overcome these various difficulties, areas of sea were reserved for British submarine operations and forbidden to Allied aircraft. Also, while British under-water craft were passing through areas patrolled by aircraft they did so on the surface, usually under escort. In addition, the air stations concerned were previously informed whenever Allied submarines would be on passage through patrolled areas.

In April 1917 the U-boat campaign was conducted with unprecedented intensity and, in the first fortnight, the toll of Allied shipping averaged 28,000 tons a day. One great area of destruction spread fanwise into the Atlantic Ocean from the south-west point of Ireland, and another from Land's End. The situation had become critical. An arithmetical calculation, based on what the U-boat had already achieved, sufficed to indicate the month in which the Allied cause must suffer eclipse. The existing anti-submarine defences, widespread and intricate as they were, had proved entirely inadequate. One of two methods must now be adopted. Either every available force must be concentrated for the offensive against the U-boat, or else distributed in defence of the merchant vessels. On these alternatives naval opinion was sharply divided.

There was, however, no time for debate or experiment. A decision must be taken quickly and it soon became clear what that decision must be. It was indicated in the experience along the Dutch trade routes open to rapid attack, by aircraft, submarines, or destroyers, from the Bight or from Zeebrugge. After the capture of the *Brussels*, in June 1916, the Harwich Force had been called upon to provide escorts for British ships transporting goods from Holland, a routine known as the 'Beef Trip'. By November 1916 it had been shown that the convoy system gave the greatest security, and the merchant vessels in the Dutch trade assembled for a bi-weekly escort by light cruisers and destroyers. As it was impossible for ships to collect in Dutch waters for the homeward journey without German agents discovering much of what was happening, the convoy suffered attacks from time to time, but, on the whole, the arrangement was remarkably

successful, although it constituted a drain on the resources of the Harwich Force. Early in 1917, the escort was supplemented by flying-boats from Felixstowe. On the evening before the departure of the convoy from Shipwash, a search was made by flying-boats along the route the ships would follow (the route was continuously changed), and next day a patrol, five to ten miles ahead of the convoy, was provided by a relay of flying-boats.

A system of convoys had also been adopted in the Western Channel for ships engaged in the French coal trade. This trade had suffered severe attacks towards the end of 1916 and many vessels had been lost. Representations by the French authorities led eventually to a system of controlled sailings, which were put into force on the 7th of February 1917, over three different routes. The groups of vessels, which steamed in rough formation, were escorted by armed trawlers, and the results seemed to confirm that here was the means of defeating the U-boat. In the three months, March to May 1917, only nine vessels were lost out of a total of 4,016 convoyed along the three routes. The word 'convoyed', however, requires some qualification. The escorting vessels were at no time considered adequate to resist determined attacks and, as much as anything, their task was to give the masters of the colliers confidence. The success of the system was due in part to the fact that the vessels passed over well-patrolled routes and that the sailings could be easily delayed or altered up to the last moment in accordance with the latest Admiralty intelligence about U-boat movements in the area.

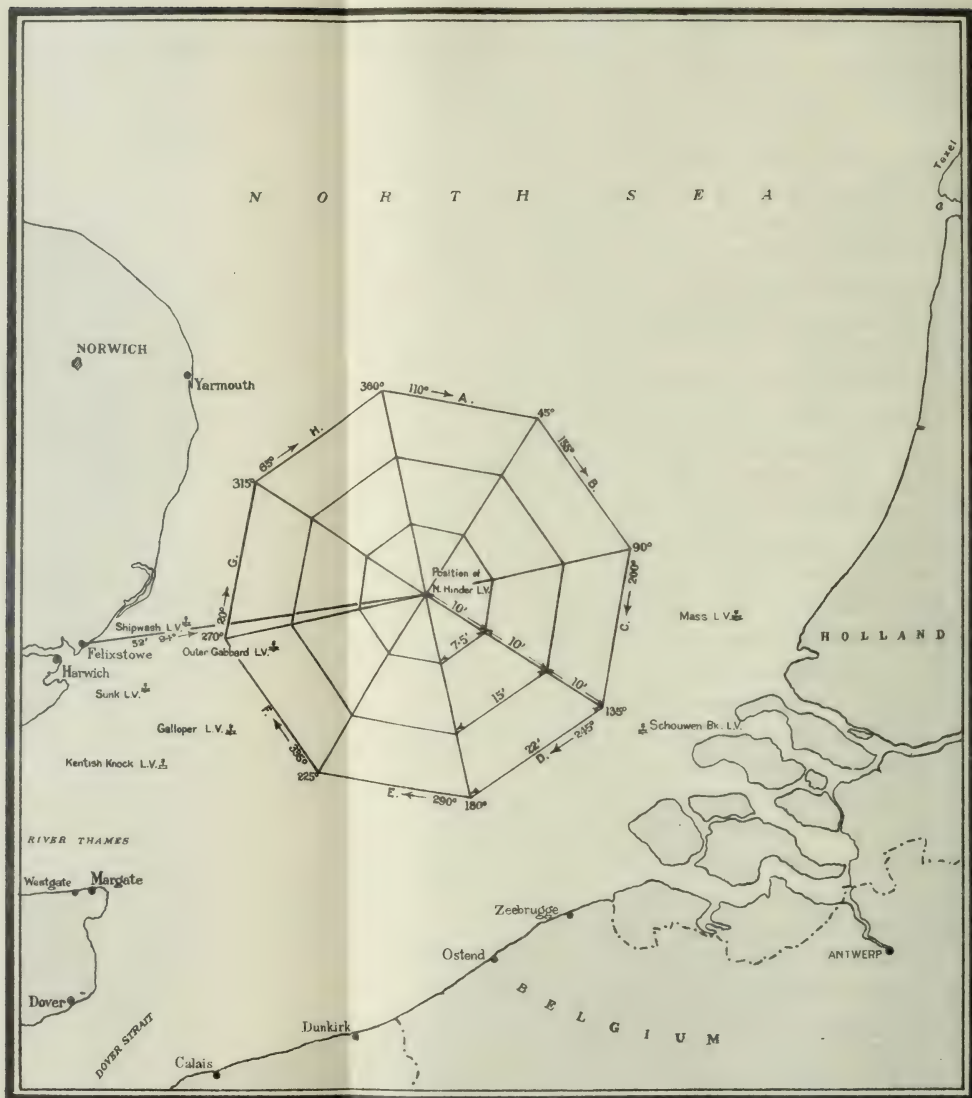
With the lessons of the French coal trade and of the Dutch trade before them, the Admiralty made their decision for a comprehensive scheme of convoy. Some of the main obstacles in the way of the organization of convoys had, by this time, been removed. Hitherto many captains of merchant vessels had been opposed to the idea because they would not, they said, be able to keep station among vessels of diverse speeds and sea-going qualities, but they had come to realize that, in face of the seriousness of the U-boat threat, this was an objection which must, and could, be overcome. For a long time, also, an adequate

NORTH HINDER FLYING-BOAT PATROL

(SPIDER-WEB)

FELIXSTOWE AIR STATION

APRIL, 1917.



number of destroyers, sloops, and other escorting vessels had not been available, nor had the necessary guns. Although there had been a great expansion in this class of ship there was still a shortage, but the entry of the United States of America into the war on the 6th of April had increased the naval resources at the disposal of the Allies, especially destroyers. Furthermore, so long as America had remained neutral, the obstacles, political and administrative, in the way of organizing and collecting convoys in American harbours had appeared insuperable.

A special organization was set up at the Admiralty under Rear-Admiral Duff, who was appointed Assistant Chief of the Naval Staff on the 31st of May 1917.¹ The first experimental ocean convoy, of sixteen ships, was assembled at Gibraltar and sailed for England on the 10th of May. An escort of six destroyers met the convoy outside the danger area on the 18th, and, next afternoon, a flying-boat from the Scillies patrolled the route. No attack on the convoy was attempted and the ships dispersed to their various destinations.

Felixstowe Flying-boats

While the convoy system was being organized, an anti-submarine offensive was being developed from the Felixstowe flying-boat station. It was known that many of the U-boats, on passage to their hunting-grounds, passed near the North Hinder Light Vessel which was used as a navigation mark. Because of their restricted radius of action when driven submerged by electric motors, and of their need to economize battery power, most of these U-boats crossed the area on the surface. A method of search by the flying-boats, to become familiar as the *Spider-Web*, was devised.² The web, centred about the North Hinder Light Vessel, was an imaginary octagonal figure, sixty sea miles in diameter. There were eight radial arms (each thirty miles long), and chords, joining the arms, ten, twenty, and thirty miles from the centre. The web, which enabled about four thousand square miles of sea to be searched

¹ Captain W. W. Fisher, R.N., succeeded Rear-Admiral Duff in the Anti-Submarine Division.

² Map facing.

systematically, was laid across the known tracks of the submarines which, at cruising speed, might be in danger of being seen during a maximum period of about ten hours. Under normal conditions one flying-boat could search two complete sectors, enclosed by the arms, or a quarter of the whole web, in five hours.

At Felixstowe a chart was kept on which were fixed, from time to time, the positions of the U-boats as revealed by directional wireless. This chart indicated which sectors of the web were likely to yield results to a search. From Felixstowe the return journey to the North Hinder was one hundred miles, and as the flying-boats had the endurance to cover approximately three hundred miles, a substantial area of the web could be patrolled on each trip. The *Spider-Web* scheme was begun on the 13th of April 1917, with five flying-boats. By the end of the month, in twenty-seven patrols, eight U-boats had been sighted and three of them had been bombed, and there had been one engagement with German destroyers.¹ The large flying-boat had this advantage over other heavier-than-air craft, that it could carry bombs of 230-lb. weight which might cause serious damage even though they did not score a direct hit.

On the 20th of May the patrol achieved its first success. A flying-boat (Flight Sub-Lieutenants C. R. Morrish and H. G. Boswell, 1st Air Mechanic W. P. Caston, and Leading Mechanic A. E. Shorter), on patrol east of the North Hinder, sighted a submarine in full buoyancy about five miles away. The pilot bore down on the U-boat and, as recognition signals went unanswered, two bombs were dropped, each of which exploded in front of the conning tower. The U-boat went under and patches of oil came to the surface, but there was no real indication of her fate. A post-war comparison with the German records, however, has revealed that she was probably the *U.C.36* which never returned to her base. This seems to have been the first direct sinking of a U-boat by aircraft during the war.

¹ The Commodore at Harwich reported that the flying-boat patrols had brought about a marked decrease in enemy mine-laying in the Harwich area.

Meanwhile an H.12 flying-boat, which had been sent from Felixstowe to Calshot for mid-Channel patrols, was also doing good work.¹ On the morning of the 24th of April an S.O.S. was received from an Italian ship saying she was under attack from a U-boat south of Portland Bill. Surface craft and seaplanes were immediately sent out, and the flying-boat, which had landed at Portland the previous day with minor engine trouble, also went away to search the area. The flying-boat's crew found the U-boat on the surface and, probably because the morning was misty, approached within a quarter of a mile before the submarine commander became aware of the danger which threatened him. He then prepared to dive, but while his conning tower was still awash, two bombs of 100 lb. weight, dropped from the flying-boat, exploded above the submarine. Oil and bubbles came to the surface and, after a further uneventful patrol in the vicinity, the flying-boat's crew returned to their base reasonably confident that they had disabled or destroyed the U-boat. About an hour later, however, a destroyer saw the submarine breaking surface again near where she had last been seen and attacked. The destroyer dashed towards her, but she had submerged before the British vessel reached her. Judging the position of their target from her wash, the crew of the destroyer dropped two depth-charges and, following the explosions, oil gushed to the surface and spread over a large area. Patrols were maintained throughout the day and a hydrophone watch kept during the night. Late in the evening, a motor noise heard in the hydrophone of one of the destroyers seemed to imply that the U-boat had got under way again, but the Admiralty, weighing all the evidence, decided that the U-boat had been destroyed. She may have been the *U.B.39* which sailed on April the 23rd, but never returned.

Attacks by German Torpedo-carrying Aircraft

Alarm had been raised by a new kind of threat against British shipping. In the early morning of the 19th

¹ The establishment laid down for Calshot was four 200 or 240 horsepower Short seaplanes and six large flying-boats.

of April six enemy seaplanes appeared off the Goodwin Light Vessel, three of them carrying torpedoes and the others acting as escorts. The first attack was made against the North Goodwin Drifter Division and one torpedo was fired, from a height described as 'very low', at the armed drifter *Carolbank*, but the torpedo just missed. The next attack was made on the s.s. *Nyanza*, but, once again, the torpedo missed its mark. Meanwhile two of the seaplanes, which were apparently operating in pairs, had flown on to Ramsgate. There they found the monitor *Marshal Ney* which had been moored out as a floating battery in the north entrance to the Downs to counter the 'cut-and-run' night raids of German destroyers. The *Marshal Ney* was a bulged monitor, immune from sinking by torpedo attack, but the enemy seaplane pilots were probably unaware of this. However that may be, one of them, after circling round the *Marshal Ney*, dropped his torpedo as he skimmed the water at close range, but the missile failed to score a hit and sped on to Ramsgate harbour, where it embedded itself in the mud after passing harmlessly underneath a dredger.

The enemy had achieved surprise, but this great advantage was frittered away because the various attacks were not well delivered. Although no damage had been caused, however, the moral effect was great. It was supposed that the effort was a prelude to more serious attacks, and this fear, which was shared by the Admiralty, seemed to be confirmed when, on the 1st of May, the s.s. *Gena*, while under way, was sunk in the war channel north-east of Southwold by a torpedo dropped from a low height by a seaplane from the Zeebrugge base. Before the *Gena* went under, she had got off two rounds from her gun and with her second had shot down the escorting seaplane, the two occupants of which were taken prisoners by the patrol vessels which rescued the *Gena's* crew.

The first effect of these torpedo attacks was to bring all aircraft under suspicion, and, in at least one naval command, instructions for dealing with aircraft were drafted of which a not unfair summary would be 'shoot first and

challenge afterwards'. If British ships were now to open fire without hesitation, as the orders stated, on any aircraft whose friendly character was in doubt, the way of the naval airman would be difficult. A second effect of these aircraft torpedo attacks was the setting aside of fighting aircraft specially to combat the enemy seaplanes. In the middle of May, a Flight of fighting aeroplanes, fitted with air-bags, was established at Walmer to protect merchant vessels in the Downs, especially vulnerable because they were at anchor. At the same time arrangements were made for patrols by fighting aeroplanes, from the existing air stations at Yarmouth, Felixstowe, and Westgate, over the war channel between Yarmouth and the Dover Straits.¹ Another arrangement was the placing of a gun, either a machine-gun or a 3-pounder, and crew, in merchant vessels moving along the danger area up and down the East Coast. When the vessels had passed through the area, the guns and crews were transferred to other merchant ships for the return passage. The real significance, however, of these counter-measures was the sense of anxiety which the threat, rather than the achievement, of torpedo-carrying aircraft had produced. In fact, the apparent half-heartedness which had characterized the first efforts persisted. The Admiralty collier *Birchgrove* was missed by two torpedoes from two seaplanes on the 20th of May. The first was fired from 1,000 yards and passed under the ship, and the second, fired from 200 yards, was avoided by a quick use of the helm, and passed ten feet from the stern. The seaplane pilots then attacked with their machine-guns, but although many bullets hit the *Birchgrove*, no casualties were caused. There were no further attacks of this kind until the 14th of June when two ships off the Shipwash Light Vessel survived two similar attacks. Next day, however, the s.s. *Kankakee* was sunk by a torpedo fired from a range of about 3,000 yards from a seaplane off Harwich. There was quiet after this until the 9th of July, when shipping between the Sunk and the Shipwash Light Vessels attracted attention. In the

¹ In August 1917 the establishment in aeroplanes for this anti-torpedo-aircraft defence was laid down as thirty fighters.

afternoon three torpedoes, from a formation of five seaplanes, were fired at three separate ships of a convoy of sixteen, but there were no hits. In the evening two torpedoes were aimed, again without success, at other ships east of Southwold. One of these, the s.s. *Haslingden*, shot down one of the seaplanes with her twelve-pounder. A second German seaplane landed alongside and rescued the crew, but with the extra load could not get off the water again and eventually surrendered to an armed trawler. The failure of these attempts was followed by a lull in this form of attack until the 9th of September, when seven seaplanes swooped down on the coke-carrying s.s. *Storm*, of 264 tons, off the Sunk Light Vessel. Three of the seaplanes attacked with torpedoes. The first torpedo, which was dropped from a height of about twenty feet at a range of 200 yards, passed under the ship whose draught was 13 feet 6 inches. The torpedo from the second seaplane hit the *Storm* aft, and the resulting explosion filled the life-boat with coke and made it impossible to abandon the ship. Next came a bomb which destroyed the steering gear and the captain's cabin. Almost at once a torpedo from a third seaplane hit the ship forward. The *Storm* was now sinking rapidly and, as she was going down, several more bombs hit her, and machine-gun fire from the seaplanes swept her decks. From the time the first torpedo struck until the vessel disappeared under the water only two minutes elapsed. This experience, however, confirmed the Germans in their belief that the results were not commensurate with the efforts involved, and operations by torpedo seaplanes against merchant shipping were abandoned. The successes in truth were not great. Had the attacks been made with more deliberation and from closer range their effect must have been greater but, as it was, they sufficed to create a new danger zone for shipping which extended along the waters from off Cromer round the coast to Portsmouth. In this area, by Admiralty instructions, all merchant ships were to keep a look-out for aircraft, and armed vessels were to keep their guns laid on all approaching aircraft, ready to fire if an attack developed.

Ocean Convoys

After the first experiment of convoying ocean traffic, a committee had been appointed to survey the whole problem. They presented their report on the 8th of June 1917, and recommended eight outward and eight homeward convoys in every eight days. The ports of assembly suggested for homeward traffic were New York, for vessels in North American ports; Hampton Roads, for Panama and American ports south of New York; Dakar, for ships from South America, South and West Africa, Australia and the East; and Gibraltar for traffic from the Mediterranean. From each of these ports two convoys were to come home every eight days.

By the middle of July four homeward bound convoys were sailing every eight days, two from Hampton Roads, and one each from New York and Sydney (Cape Breton, Canada). The first of the regular Gibraltar convoys sailed before the end of the month, and, early in August, the arrangement was extended to the South Atlantic traffic. By the middle of August a provisional programme had been worked out for outgoing traffic, and convoys set out, in the next few days, from the assembly ports at Milford Haven, Falmouth, Devonport, Queenstown, and Buncrana.

The efficient working of the scheme required world-wide organization, co-ordinated in every detail.¹ So far as the air service was concerned, the convoy system brought great advantages. It narrowed and defined the area of search and made it easier to systematize the employment of the anti-submarine aircraft. These could now be organized to provide (i) escorts for convoys, (ii) routine patrols, and (iii) emergency patrols for hunting U-boats definitely reported. The major part of the aircraft patrolling and escort work was done by the non-rigid airships. Under the orders of the senior naval officers of the various commands, the airship crews searched the routes before the departure of the vessels, and later escorted

¹ For the organization of the convoy system, see *Naval Operations*, by Sir Henry Newbolt, vol. v, ch. iii, section 3.

the convoys through the patrolled areas. The cross-Channel transports on the Folkestone-Boulogne route were regularly escorted by airships from the Capel station; the traffic between Larne and Stranraer, as well as convoys on their way to the north-west passage, by airships from Luce Bay; and northward bound convoys from the Humber were escorted by relays of airships from the stations at Howden, East Fortune, and Longside.

The base at Mullion in Cornwall was, by reason of its position facing the western danger zone, the most active of all the airship stations. Its patrol area extended eastwards to Plymouth, and westwards into the Atlantic beyond the Scillies. An intelligence section was organized at the station to co-ordinate information on the ways of U-boats in general, and to plot, in particular, all that was learned of U-boat activities in the immediate area. Each night, after study of the latest intelligence information, the airship patrol areas for the following day were allotted. The airship, slow in speed and in manœuvre, could seldom hope to destroy a submarine. The U-boat commander usually had time, once he had sighted an airship, to make an unhurried dive out of harm's way. But this is not to say that the airship was not feared. She could, and would, call up surface craft to attack with depth-charges, and she might be able to follow the track of the U-boat below the water, either by direct observation or through a trail of oil. The submarine could only be brought to the surface again with caution. If she reappeared and found the airship, or surface ships, within striking distance of her, she had to face certain attack and possible destruction. The airships, in fact, were treated by the U-boat commanders with the respect paid to the policeman by the law-breaker and were given a wide berth. Not by 'doing', but by 'being' they saved many vessels. Submarines, time after time, were forced to dive to escape detection, and the consequent reduction of their speed below the surface, more often than not, made it impossible for them to get into position to deliver an attack. Down to the end of December 1917 there was no

single instance of a ship, escorted by aircraft, being attacked by a submarine.

Examples may be quoted to illustrate the work of the aircraft patrols. In August 1917 the important American 'Cleveland' Convoy was being escorted up-Channel. In the early morning of the 9th the convoy had been met by a flying-boat from the Scillies which flew with the ships until relieved by a seaplane from Newlyn. Soon after 9 a.m. the air escort was taken up by two airships from Mullion, and, ninety minutes later, the airships sighted a U-boat on the surface seven miles ahead of the convoy which she was steaming at full speed to intercept. The airships bore down on the U-boat and dropped bombs in her wake after she had submerged. In answer to their signals, escorting destroyers left the convoy and dropped depth-charges. The U-boat did not again show herself and the convoy passed through the danger area without further incident.

In 1917 airships from Mullion flew a total of 2,845 hours, which was more than were flown by any other airship station round the coasts, escorting convoys and troop-ships, and co-operating with destroyers and other surface craft in searching wide areas of sea. One of the 'Coastals' attached to this station had a remarkable record in the war. She was the *C.9*, commissioned in July 1916. By the end of the war, she had spent 2,500 hours in the air, during which she had covered a distance of over 70,000 miles. Associated with this ship, as captain, for much of her history, was the name of Flight Commander J. G. Struthers, one of the best-known airship commanders of the war and an expert on the problems associated with the hunting of submarines from the air. On the 3rd of October 1917, when the *C.9* was making her way back to Mullion, all airships having been recalled owing to a rising gale, Flight Commander Struthers saw, about six miles astern of the airship, an explosion amidships an Italian steamer, one of a group of six on a westerly course near Bolt Head. The *C.9* was at once swung round and, with the high wind behind her, made a speed of 95 knots and reached the sinking steamer in two and a half minutes. The residual track of a torpedo was visible on the

water, and at the extreme end of the track, the outline of a submarine, just below the surface, was seen from the airship. Delay-action bombs were dropped on the U-boat, and patrol vessels were summoned by wireless to take up the hunt. These, directed on the spot by the airship, 'salted' the area with depth-charges, and as quantities of oil came to the surface it seemed probable that the U-boat had been sunk. When the airship captain was so informed, he turned the *C.9* for home, but with the full force of the gale against him had difficulty in making his station, the journey of forty miles taking six hours. At times, when the force of the wind approached sixty miles an hour, the ship could make no progress at all. According to the German lists of U-boat losses, none was destroyed in this area on the 3rd of October, and it must be assumed that the submarine, although possibly damaged, got back to her base. There were many similar instances of this kind, not only from Mullion, but from the other airship, seaplane, and aeroplane bases round the coasts of Great Britain, and what has been said before may be repeated, that, apart altogether from the known sinkings, the anti-submarine aircraft imposed restrictions on the U-boats which severely limited their activities.

There was one area, occasionally patrolled by airships, which the enemy contested. In the southern part of the North Sea, attacks were made on the airships from time to time by fighting seaplanes from Zeebrugge. On the 21st of April 1917 the coastal airship, *C.17*, from Pulham, had drifted off her course in thick weather and had been shot down in flames off the North Foreland. As a result of this loss, patrolling airships had been ordered, when out of sight of land, to check their positions by wireless every hour, a proceeding which had the disadvantage that listening enemy stations could pass the information to the German seaplane commanders. On the morning of the 11th of December 1917 the *C.27*, also from Pulham, on patrol east of the Norfolk coast, was silent after exchanging wireless messages for two hours. It was afterwards learned that she had gone down in flames with her crew of five as a result of an attack by a seaplane from Zeebrugge. After

this loss, patrols by non-rigid ships south of the Norfolk coast were abandoned.

Kite Balloons

As for co-operation with the Fleet, so for anti-submarine work the merits and disadvantages of the kite balloon aroused keen controversy. A balloon flown from a vessel escorting a convoy might advertise the presence and course of the ships to a distant and invisible U-boat which would then be able to submerge and get into position for attack. For this reason balloons were not, at the outset, used by convoy escorts but, flown from destroyers, they came into limited use for independent submarine hunting. Experience gained during Grand Fleet operations in June and July 1917 gave a decided stimulus to the use of the balloon. The tracks followed by the ocean-going U-boats across the North Sea were by this time fairly well known, and an operation was planned by Admiral Beatty in June to catch the incoming boats. The British forces maintained their dispositions in the North Sea for nine days, and during that time U-boats were sighted sixty-one times. Only twelve attacks, however, could be made, none of which was successful, and Admiral Beatty formed the opinion that, had the patrolling destroyers carried balloons, the hunting of the submarines could have been directed with greater chances of success. On his recommendation, therefore, a Kite Balloon Force of six destroyers, five of which carried balloons, was organized. The destroyers were to spread out across the U-boat tracks and make an experiment in co-operative stalking. During the first operation, early in July, although submarines were sighted from the balloons, no attacks could be developed, but when the force (five destroyers, of which three towed balloons) went out again, on the 11th of July, success was achieved. In the early morning of the 12th the observer in the balloon flown from the *Patriot* (Flight Lieutenant O. A. Butcher) sighted a U-boat on the surface twenty-eight miles distant, and the destroyer raced away to the area. Before she arrived, the submarine had gone under, but shortly reappeared on the surface four miles off. The *Patriot* opened

fire, but the U-boat went under again before a hit could be made, whereupon the destroyer, guided by the observer in the balloon, dropped depth-charges. A small quantity of oil came to the surface, insufficient to indicate certain damage to the submarine, and a close watch over the area was maintained. Sometime later, however, there was an under-water explosion in the place where the U-boat had submerged, and a great oil patch began to form. Such was the end of the *U.69*, and this success led to the opening of new balloon bases at ports where destroyers and other patrol vessels were favourably placed for submarine hunting. By the end of 1917 additional bases were in operation at Tipnor (Portsmouth), Rathmullen (Lough Swilley), and Immingham.¹

Flying-boats and U-Boats

Meanwhile the Felixstowe flying-boats had been greatly harassing the smaller U-boats. On the 28th of June a submarine in full buoyancy was sighted from a large flying-boat (Flight Lieutenant W. R. Mackenzie, Flight Sub-Lieutenant R. F. L. Dickey, Air Mechanic J. Watts, and Air Mechanic E. E. Hughes), which was escorting the 'Beef Trip'. The pilot promptly dived on her and three 100-lb. bombs were dropped before the U-boat was completely submerged. Oil and air bubbles appeared to indicate that the enemy vessel had been destroyed or damaged, but the loss cannot be confirmed, although she may have been the *U.B.36* which met her end about this time in unknown circumstances.

The enemy pilots took up the challenge. Fighting sea-planes began to appear in the area of the North Hinder Light Vessel, and, on the 4th of July, the offensive was carried to Felixstowe when fourteen aircraft bombed the air station sheds. A flying-boat was destroyed, another badly damaged, five ratings and three civilians were killed, and nineteen ratings and one civilian injured. On the 22nd the raiders came again, but they caused no further damage or casualties at the seaplane base.

¹ These were additional to existing balloon bases at Scapa, Rosyth, Lowestoft, Shotley, Sheerness, Devonport, and Milford Haven.

That the German antipathy to the Felixstowe flying-boats was well founded was again made clear two days later. On the 24th of July Wing Commander J. C. Porte led five of his boats to the North Hinder, near which the periscope of a U-boat was sighted. Five bombs of 230-lb. weight were dropped ahead of the periscope by three of the flying-boats, and oil and wreckage came to the surface to mark the end of the *U.C.1*.

The next success came quickly and in peculiar circumstances. On the morning of the 29th of July the *U.B.20*, which had been undergoing a two months' overhaul, left Zeebrugge for diving trials outside the harbour. As the day was fine and the trip promised to be uneventful, the commander of the submarine had invited some of his friends to go with him, among them two nursing sisters from a local hospital. The U-boat was found on the surface by a Felixstowe flying-boat, which put her out of control with four bombs. As she lay helpless a second flying-boat appeared and completed her destruction.

These air successes exceeded naval expectations. As a result of the whole naval offensive against the U-boats, in July, four submarines were destroyed, and one was damaged and forced into Corunna, where she was interned. Of the four destroyed, Felixstowe flying-boats, unaided, accounted for two, and a third was lost chiefly through the agency of a destroyer's kite balloon.

Towards the end of August U-boat activity increased off the mouth of the Tees, and as no seaplanes could be diverted from other and regular danger areas, a Flight of four Handley Page aeroplanes was brought back temporarily from Coudekerque, France, for inshore patrols off the north Yorkshire coast. The aeroplanes reached Redcar on the 5th of September 1917 and operated for about one month, during which time eleven U-boats were found and seven of them attacked with bombs. None was destroyed, but the harassing effects of the Handley Page patrols greatly eased the situation off the Tees. On the 2nd of October the Flight was transferred to Manston as the nucleus of a bombing squadron, called 'A' Squadron (later 216 Squadron), for independent bombing operations,

in co-operation with Royal Flying Corps squadrons, from the Nancy area, against industrial centres in southern Germany. It may be noted that the withdrawal of the Handley Pages, which had proved their value for anti-submarine patrol work, was a result of the German attacks on London which had led to the proposal to form an independent bombing unit for raids into southern Germany.

The next definite success of the Felixstowe *Spider-web* patrol came at the end of September. On the morning of the 28th wireless interception indicated a U-boat near the North Hinder, and a flying-boat took up the hunt.¹ The flying-boat reached the North Hinder at 8 a.m. and then began to search in a southerly direction. After twenty-eight minutes, the wireless operator in the flying-boat reported that he was intercepting signals from some type of enemy vessel less than ten miles distant. Within six minutes a submarine, in full buoyancy, and showing a mast and a gun, was sighted a mile ahead. Recognition signals, fired from the flying-boat, went unanswered, and the pilot thereupon steered direct for the U-boat. A 230-lb. bomb was dropped on her, from 600 feet, but before it exploded a shell from the submarine's gun burst fifty feet from the flying-boat. Then, looking down, the crew of the aircraft saw their bomb blow in a part of the U-boat's deck. Meanwhile fire from another direction was opened on the aircraft and three U-boats, with a destroyer and seaplane escort, were seen approaching through the mist. The pilot of the flying-boat thereupon made a second run over the crippled U-boat and completed her destruction with another 230-lb. bomb. She was the *U.C.6*, a mine-laying craft from Zeebrugge. The flying-boat, with no bombs left, made direct for home, but as she went she sent out a wireless message giving the position of the U-boat and destroyer formation. The message was received at Felixstowe and three '*Large Americas*' were dispatched independently, but although

¹ The flying-boat's crew were Flight Lieutenant B. D. Hobbs, Flight Sub-Lieutenant R. F. L. Dickey, and Air Mechanics E. M. Nicol and J. A. Mortimer. The two officers had been responsible for the destruction of the Zeppelin *L.43* on the 14th of June 1917.

they found the destroyers and the seaplanes, they could not get into position for effective attack.

On the 1st of October 1917 one of the *Porte* flying-boats from Felixstowe,¹ while on patrol in the neighbourhood of the North Hinder Light Vessel, was attacked by an aeroplane and two fighting seaplanes. There was a running fight for twenty minutes, but, by skilful side-slipping, Flight Lieutenant B. D. Hobbs, who was at the controls, avoided many of the attacks, and a vigorous fire was meanwhile maintained from the *Porte*'s machine-guns. Finally, however, the centre and port engines in the flying-boat were shot out of action and she was forced down on the water. As she lay on the surface she was again raked with machine-gun fire from the attacking seaplanes, and a bullet wounded Air Mechanic H. M. Davies. When the enemy aircraft had gone, the crew worked on the repair of the damaged engines which were patched sufficiently to enable the flying-boat to be taxied slowly in the direction of the English coast. At 1.30 a.m., nine hours after she was shot down, and after a difficult and trying journey with frequent stoppages, the flying-boat safely reached Sizewell Gap, north of Orfordness, whence she was towed back, without mishap, to Felixstowe during the morning. In the fight with the enemy aircraft, Air Mechanic C. Spikings, by continuing to serve his gun after the engines near him had been set on fire and he had been scalded with water, helped to keep the enemy pilots from pressing home their attacks. He also worked on the repair of the engines for some hours during the night in spite of the fact that his hands were badly burned. As a result of this experience, it was decided not to use the *Porte* flying-boats for the patrol of areas where they would be liable to attack, unless they could be given an escort of *America* type aircraft.

The North Sea Barrage

In September 1917, at an Allied Naval Conference, Admiral Jellicoe put forward a scheme for a minefield from

¹ *Crew*: pilots, Flight Commander N. Sholto Douglas and Flight-Lieutenant B. D. Hobbs; engineer, Lieutenant M. W. W. Cross, R.N.V.R.; armament officer, Sub-Lieutenant H. O. Fry; air mechanics, C. Spikings and H. M. Davies.

Scotland to Norway with the object of closing to U-boats the north-about route to the Atlantic. The scheme, which was approved, contemplated patrols by a special force of destroyers, sloops, 'P' boats and trawlers, and, in the western section of the barrage line, by flying-boats, airships, and by balloon-carrying vessels. Arrangements were begun, but it soon became clear that without a naval base in Norway, adequate support for the patrol vessels could not be guaranteed and, in January 1918, it was decided to shift the mine-barrage and patrol line farther north. This alteration made no great difference, except to aircraft co-operation. Airships, it was considered, could not be effectively used from the base at Longside, nor seaplanes from Dundee, and the patrolling had now to be ensured by balloon-carrying vessels and by a few large flying-boats from the station at Houton Bay, and from moored positions in Loch Stenness, Strath Beg, and Catfirth.¹ Flying-boats had operated from moorings in the Scilly Islands with fair success during the summer of 1917, but the weather conditions in the northern waters proved much less favourable for mooring and for flying.

The French Coast

Anti-submarine operations in the English Channel were the concern of France as well as England, and there was close liaison between the two countries. By an agreement of May 1917, special areas of search had been allotted to the French air services, and a common code for aircraft communication with surface ships had been drawn up.

On the 21st of July, a Naval Air Service station was opened, with three seaplanes, at Cherbourg, as a sub-station of Calshot. The new station had an early success. In the morning of the 18th of August a U-boat had been reported north-east of Cherbourg. The pilot of a Wight seaplane, who went up in search, had sighted the submarine, but could not get up with her in time to attack,

¹ The air stations at Houton Bay and Peterhead were intended to serve as repair and store depots for Loch Stenness and Strath Beg, and a repair &c. shed for the flying-boats was built at Catfirth. At Houton Bay a great amount of constructional work for the housing of the flying-boats was undertaken.

nor could he find the craft again although he patrolled for some time. The same Wight was taken up later in the afternoon by Flight Sub-Lieutenant C. S. Mossop, with Air Mechanic A. E. Ingledew, and the U-boat was found again on the surface. This time she could not completely submerge before the Wight got into a favourable position to attack, and the first 100-lb. bomb from the seaplane exploded just ahead of the periscope. The pilot turned for a second attack, but, in fact, this was unnecessary. The *U.B.32* had gone down with her crew, the first submarine to be destroyed in the Channel by direct attack by British aircraft.

U-boat hunting in the Dover Straits and the Flanders Bight by naval aircraft from the Dunkirk and Dover bases met with keen opposition. German aircraft, operating from Zeebrugge, maintained a troublesome activity, and British patrolling aircraft had to be given an escort of fighting seaplanes. In November 1916 Wing Captain C. L. Lambe had asked for an increase in his establishment of fighting seaplanes from six to twenty. This proposal had been approved by the Admiralty and, in January 1917, the Dover-Dunkirk seaplane organization was standardized into Flights (six aircraft) of which three were to be stationed at Dover and four at Dunkirk. But although the increased establishment was approved, the Admiralty, in February 1917, warned Captain Lambe that in view of the great demands for aircraft to patrol the western approaches to the Channel, it would be some time before his requirements would be met.

Early in March 1917 the enemy opened an additional seaplane base (*Flanders II*) at Ostend. By May *Flanders II* had ten seaplanes available and the Zeebrugge station (*Flanders I*) thirty-seven. These figures represented a notable increase in German seaplane strength and the effect was soon apparent. In May six French flying-boats were shot down, four by *Flanders I* and two by *Flanders II*. The Commodore, Dunkirk, thereupon reported to the Vice-Admiral, Dover, that if the Dunkirk fighting air strength was not increased it would be impossible to cope with the enemy in the air off the Belgian Coast or over the

southern part of the North Sea. The French, he said, had few aircraft left after their recent losses, and the Dunkirk seaplane base could muster no more than five fighters of which three were under repair. The Admiralty thereupon allotted an additional nine 'Baby' seaplanes to Dunkirk.

In spite of the enemy air opposition, anti-submarine patrols were attempted on suitable flying days, usually at dawn and dusk. On the evening of the 25th of May 1917 a routine patrol of this kind, made by two Short seaplanes escorted by two 'Baby' seaplanes, found a U-boat north of Dunkirk. One of the Short pilots made to attack, but engine failure forced him to alight on the sea near where the U-boat was diving. The other Short and one of the escorting seaplanes returned to Dunkirk for assistance, and the remaining escort, after circling for some time, was compelled to follow them through lack of petrol. A later aircraft patrol, specially sent out from Dunkirk, found the Short seaplane with a U-boat alongside. The pilot dived and the submarine went under, taking with her, as prisoners, the two officers (Flight Lieutenant C. Laurence and Flight Sub-Lieutenant L. J. Bennett) from the Short.¹

The inability of the Dunkirk seaplane pilots to do useful work in face of the opposition by German fighting aircraft, led Captain Lambe, in June 1917, to propose that the seaplane fighting pilots should be transferred to land aircraft, and he suggested Sopwith 'Pups' (eighty horse-power Le Rhone engines), fitted with air-bags. The matter was referred to the Admiralty by Vice-Admiral Sir Reginald H. S. Bacon.

While the submissions of Captain Lambe were under consideration, they were given point by another episode involving Dunkirk seaplanes. At 6 a.m. on the 19th of June a Short seaplane, escorted by two Sopwith 'Baby' seaplanes,

¹ There is another instance of flying officers being captured by a submarine. On the 28th of November 1916 a Short seaplane from Felixstowe (Flight Sub-Lieutenant G. L. Davies and Sub-Lieutenant A. C. Stevens), while on reconnaissance patrol, was forced to land with engine failure. The two officers were captured by a U-boat they had been hunting, and were taken, as prisoners, to Germany.

set out on a mine and U-boat patrol. An hour later, while a thunderstorm was raging over Dunkirk, the bell in the pigeon-loft rang to give warning of the arrival of a bird. When the messages were retrieved (two pigeons had flown in), they proved to be from one of the Sopwith 'Baby' seaplane pilots, Flight Lieutenant R. Graham. They read: (i) 'Short shot down—Potvin? Ten NNE Nieuport. One 'Hun shot down. My tanks shot. French TBD on its way. 'Send fighters,' and (ii) 'Short landed O.K. down NNE 'Nieuport—Potvin? I shot one down but he did not crash. 'My tanks no good—can't climb. French TBD on its way. 'Send more fighters. Quick.' Flight Sub-Lieutenant J. E. Potvin was the pilot of the second escorting Sopwith 'Baby' seaplane, and the queries in the messages had reference to his fate. The officers in the Short were Flight Sub-Lieutenant L. P. Paine, pilot, and observer Sub-Lieutenant T. Rogers and, at 7.20 a.m., the pigeon-loft bell told of the arrival of a bird from the Short. The message, signed by Paine, read: 'Am shot down. Hit in tank, radiator. Rogers dead. Please send C.M.B. at once.'

The records of the German seaplane unit at Ostend (*Flanders II*) have been made available to the author and it is now possible to say exactly what happened. Twelve miles north-east of Nieuport, when they were half an hour out from Dunkirk, the British seaplanes were attacked by three enemy fighting seaplanes (pilots Bieber, Bachmann, and Dyck). The German pilot Dyck, after a sharp encounter, shot down Flight Sub-Lieutenant Potvin, whose seaplane crashed, but Dyck was himself shot down with a bullet in the abdomen from the machine gun of Flight Lieutenant Graham in the second Sopwith 'Baby' seaplane. Before Flight Lieutenant Graham could turn to engage the other enemy fighters, one of them (Pilot Bieber) had killed the observer in the Short and had shot through the seaplane's tank and radiator, forcing the Short pilot to land. In a further fight, the remaining Sopwith 'Baby' seaplane was shot about and, with a failing engine, Flight Lieutenant Graham had no choice but to run for home. He eventually alighted alongside a French destroyer and asked her commander to go to the assistance of

the British and German seaplanes down on the water. He himself was taken in tow by a French trawler back to Dunkirk. Meanwhile Bieber had landed his seaplane beside his comrade Dyck, had managed to get the wounded pilot aboard his own aircraft, a single-seater, and had succeeded in reaching Ostend. His fine effort, however, was made in vain as Dyck failed to survive the journey.

When the various messages were brought in to Dunkirk by the pigeons, the raging thunderstorm made it impossible to send other fighter seaplanes away. The Commodore, Dunkirk, was at once informed with a view to the dispatch of surface craft. As the reported position of the damaged seaplanes was in the vicinity of Ostend, only craft of high speed stood a chance of making a rescue, that is to say, it was a question of sending out coastal motor-boats. These torpedo-carrying craft were, however, a naval secret and there would be some risk, if they went out unescorted, of their falling into enemy hands. The Commodore decided that the risk must be taken, and two of the boats were dispatched. On the way, the engine in one of the boats broke down and the other boat went on alone, but was soon afterwards attacked by four German destroyers and, after firing a torpedo at one of them without making a hit, had to turn back. She reached harbour safely without having seen anything of the seaplanes. The other coastal motor-boat, however, crippled by its engine trouble, was cut off from Dunkirk by German destroyers and fell into enemy hands. Soon after 10 a.m. another pigeon came in from the Short with a message, timed 9.10 a.m., which said the seaplane was still afloat near the pillar buoy, and asked that the pilot should be picked up. But by this time it was too late to do anything further. Soon after the message had been written, German destroyers had gone alongside the Short and had taken off her unwounded pilot and dead observer.

This episode, which led to the loss of two seaplanes and an important coastal motor-boat, emphasized the need for first-class fighting aircraft to combat the German seaplanes. The Admiralty thereupon decided that Dunkirk should give up all seaplanes and be provided with aeroplanes,

fitted with a flotation gear, in their stead. As a result, the seaplane-carrier *Riviera* was withdrawn from the Dover-Dunkirk command in July 1917 and sent to Falmouth to supplement the air patrols of the western approaches to the Channel. The Sopwith 'Baby' seaplane ceased to fight off the Belgian Coast and gave way to the Sopwith 'Pup' with which a so-called 'Seaplane Defence Flight', formed at St. Pol, was equipped. In September 1917 the 'Pups' were replaced by Sopwith 'Camels' and the Flight was expanded into the 'Seaplane Defence Squadron', afterwards (January 1918) called No. 13 Naval Squadron.

Meanwhile Short seaplanes continued to be used, with aeroplane escort, for occasional mine and anti-submarine patrols. In July 1917, also, a *Large America* flying-boat had been sent to operate from Dunkirk for anti-submarine work. A drawback was that when the flying-boat was sent out on patrol an escort of fighting aeroplanes had to be provided, and as the petrol-carrying capacity of the fighters was strictly limited, the radius of action of the flying-boat was greatly reduced. In the early morning of the 22nd of September 1917 the flying-boat, with a Sopwith 'Camel' escort, found a U-boat, fully blown, near the West Hinder. Before the submarine could submerge, the flying-boat (Flight Sub-Lieutenants N. A. Magor and C. E. S. Lusk, Chief Petty Officer E. A. Boyd and Leading Mechanic R. A. Lucas) attacked her with two 230-lb. bombs. These scored direct hits on the hull, and the submarine—the *U.C.72*—heeled over and sank at once.

This success prompted the air commander at Dunkirk to ask for two more flying-boats for anti-submarine work, but Admiral Bacon had just previously told the Admiralty that, 'given good aeroplanes, I never wish to have another seaplane except as a life-saving appliance on rare occasions', and, despite the success of the flying-boat, Admiral Bacon saw no reason to change his opinion. His contention was that as the water area over which the Dunkirk aircraft had to operate was very limited in extent, the aeroplane, which was faster than the flying-boat and had the advantage that it could fight on equal terms with enemy aeroplanes or

fighting seaplanes, was more generally efficient for the purpose, especially as the aeroplane engines were now very reliable. The views of the Dunkirk air officers were considered by the Admiralty in conjunction with Admiral Bacon's reports, and, as a result, the use of seaplanes from the Dunkirk base was finally abandoned, except for communication purposes and for restricted patrols, for which a Flight of Shorts was retained at Dover. The Admiralty adopted a proposal of Wing Captain Lambe that the anti-submarine patrols should be taken over by a Flight of D.H.4 aeroplanes. The '*Large America*' was transferred to Felixstowe; the seaplane station at Dunkirk was given over to the American Air Service (1st of February 1918), and No. 17 (Naval) Squadron was formed at Bergues Aerodrome with D.H.4 aeroplanes on the 13th of January 1918. This squadron, to the end of the war, was responsible for anti-submarine patrols over the Straits and over the Belgian coastal waters.

The introduction by the enemy of the campaign of unrestricted U-boat warfare in February 1917 was followed, as has been indicated, by a great development in all anti-submarine measures. These may be broadly summarized as follows:

- (i) *Operations in the vicinity of the Coasts*, including protection of ships in convoy or dispersed, organized hunts, and other specific offensive actions.
- (ii) *Protection of shipping on the high seas*, that is to say, convoy, changing of shipping routes according to the latest information of U-boat movements, &c.
- (iii) *Action to bar the passage of U-boats through narrow or restricted waters.*
- (iv) *Attacks on submarine bases and on submarines in harbour.*

In the period under review, the general operations were confined mainly to (i) and (ii), but efforts were also made to close the Dover Straits, and to restrict the passage of U-boats from German North Sea ports by extensive mine-laying in the Heligoland Bight. In addition, as will be told

in the next chapter, aircraft bombing attacks were made on the U-boat bases in Belgium.

The main work of aircraft came under the heading *Operations in the vicinity of the Coasts*, and consisted chiefly of patrols in search of U-boats and the supply of escorts for merchant shipping. The employment of the various types of aircraft had come to be fairly well defined. Airships were best suited to keep constant watch over given areas, and to escort convoys through danger zones, a task for which they were particularly well fitted by their ability to keep station. Their long endurance, also, made them invaluable for co-operation with surface craft in protracted hunts. Flying-boats had some of the advantages of the airships. That is to say, they could carry heavy bombs, of a weight likely to inflict serious, and possibly vital, damage to any U-boat which was hit, they had good radius of action, the accommodation for the crew was fairly comfortable, and the view was good. They had the advantage over the airship that they were far less vulnerable to attack by enemy aircraft, that they were comparatively seaworthy, and that they could, because of their greater speed and manœuvrability, more often get into position, once a U-boat had been sighted, to make an effective attack. As compared with the airship the flying-boat suffered the disadvantage that it could not keep station with a convoy, nor had it the endurance for protracted patrols. Furthermore, there were occasions when airships could get into the air although the surface of the sea might be too rough to permit of flying-boats getting off. On the other hand, when winds might be too high for airships to operate, it was often possible for heavier-than-air craft to be used. Flying-boats were best employed for offensive action against U-boats definitely reported, or suspected, in waters outside the range of smaller seaplanes or of aeroplanes. These last-named, which could get into the air quickly and under almost any weather conditions, except mist or fog, were best used when immediate action was called for as a result of reports of U-boats in inshore waters. Seaplanes were employed from time to time on convoy work, but they suffered the disadvantage, as compared with the

airship, that their speed, relative to the convoy, made it difficult for them to keep good station. Kite balloons, towed by patrol vessels, had proved their value as elevated observation posts.

Statistics are available which show the action of anti-submarine aircraft in home waters during 1917 and the first quarter of 1918. In this period there were 170 sightings of U-boats by seaplanes (including flying-boats) and aeroplanes, and on 107 occasions the U-boats were attacked. Airships reported sighting submarines on thirty-two occasions, and they made eighteen attacks.¹ From kite balloons, nine U-boats were sighted and four of them were attacked by patrolling vessels.

The aircraft patrols traced a net-work round the whole of the British Isles with the exception of a part of the west coast of Scotland. By the end of March 1918 airships were operating from Luce Bay, Larne,² Anglesey, Pembroke, Mullion, Laira,³ Bridport,³ Polegate, Capel (Folkestone), Howden (rigid and non-rigids), East Fortune, and Longside. The inland airship stations were Kingsnorth (construction, repair, and experiment), Cranwell (School), Pulham (rigids and non-rigids, experimental), and Wormwood Scrubbs (construction and tests). Kite balloons for towing by destroyers, sloops, and other vessels were based at Milford Haven, Merifield (Devonport), Tipnor, Hythe, Shotley, Lowestoft, Immingham, North Queensferry (Rosyth) and Caldale. Seaplane (including flying-boat) stations were at Fishguard, Scillies, Newlyn, Cattewater, Torquay, Portland, Cherbourg, Calshot, Bembridge, Newhaven, Dover, Westgate, Felixstowe, Yarmouth,

¹ For sightings of U-boats by aircraft from the various patrol stations in 1917, see Appendix II.

² The shed at Larne was used, from time to time, for the temporary housing of an airship, particularly in connexion with the escorting of steamers on the Larne-Stranraer route.

³ At Laira, a sub-station of Mullion, a clearing was made in the trees, so that a small-type airship could, when required, be tethered in the open. The idea was to extend the patrol area, and it was so successful that it was decided to establish a series of mooring sites, between permanent stations, to provide a closer linked system of airship patrols. Under this scheme Bridport became a second sub-station of Mullion.

Killingholme, Hornsea, Seaton Carew, South Shields, Dundee, and Strath Beg. In addition, naval aeroplanes were stationed at Mullion, Padstow, Prawle Point, Dover, Walmer, Yarmouth, Burgh Castle, and Redcar.

To these various stations must be added, also, those which operated directly under the orders of the Commander-in-Chief, Grand Fleet, namely, Catfirth, Stenness, Scapa Flow, Houton, and Rosyth (seaplanes); Turnhouse, Smoogroo, and Donibristle (aeroplanes); and Houton Bay (kite balloons). The Scapa seaplane station was chiefly a repair and storage base for the *Campania*, the captain of which, working under the orders of the Admiral Commanding Orkneys and Shetlands, supplied all aircraft and personnel for the Scapa station as required from time to time. Whenever enemy submarines were expected to be on passage through the Fair Island Channel, seaplane patrols were made as far north as the Shetlands. When the *Campania* could be spared from the Grand Fleet, she was sent north, occasionally, to a small anchorage in the northern islands of Orkney to form a base closer to the aircraft patrol area.

CHAPTER III

NAVAL AIR OPERATIONS FROM DUNKIRK

1917-March 1918

[Map facing p. 1]

NAVAL air operations from the Dunkirk area in 1917 were governed by three main considerations. These were the activities by U-boats and destroyers based on the Belgian ports, the bombing operations of enemy aeroplanes working from aerodromes in Belgium, and, in the last half of the year, the Allied military offensive in Flanders. The U-boat and destroyer bases at Bruges, Zeebrugge, and Ostend, and the aerodromes from which the German heavy bombing aeroplanes set out to attack London and the south-eastern counties of England, were open to attack from the air, and the systematic bombing of these various targets became possible in the spring of 1917 with the arrival at Dunkirk of improved types of night and day bombers, that is, the Handley Page and the De Havilland 4. Dunkirk aircraft also co-operated in the general bombing offensive against military targets during the battles of Ypres. To resist the British bombing formations, and for retaliation, the German air strength in the Belgian coast area was progressively increased and demanded a corresponding expansion of the Dunkirk fighting squadrons.

The first bombing operations of the year were made in connexion with German destroyer activity in the Dover Straits. In October 1916 two enemy destroyer flotillas had been sent from the north German coast to Zeebrugge for attacks on British shipping in the Downs and on drifters watching the mine-barrage line. After a successful attack on the drifters on the 26th of October 1916 one of the flotillas had been sent back to Wilhelmshaven. In January 1917 the British Admiralty learned that a destroyer flotilla was again about to leave its base on the German coast to reinforce the destroyers in Zeebrugge. The Harwich Force was at once ordered to intercept the enemy, but when contact was made, early on the 23rd of January, there was an indecisive action in which the German leader was

seriously damaged, but escaped, and during which the British destroyer *Simoon* was lost. A photographic reconnaissance made about noon of the same day by aeroplanes of No. 2 Squadron at Dunkirk, revealed that the German destroyers had arrived at Zeebrugge and were lying behind the Mole. Almost at once gales and a severe frost set in, but when air reconnaissance again became possible, on the 1st of February, an unusual state of affairs, offering a unique opportunity, was disclosed. As a result of the severe weather conditions, German shipping had been concentrated in the harbour at Bruges, and the way out was temporarily closed by the locks and canals being frozen: air photographs revealed that among other vessels so immobilized were twenty torpedo craft and three submarines.

The bombing aircraft attached to Nos. 4 and 5 Wings at Dunkirk were ordered to attack and, though much hampered by engine trouble due to freezing water and oil, they had, by the 10th of February, dropped three and a half tons of bombs on the docks.¹ A German report on the effect of this bombing shows that no destroyers or submarines were hit, but that, among minor results, three ammunition sheds and a guard house were destroyed. In one of the sheds 8·8 cm. shrapnel shells, packed in sheet metal cases, were stored, but although a direct hit was made on the shed and some of the broken cartridge cases were destroyed by burning, none of the ammunition exploded. A second shed, in which was cordite stored in boxes, was hit and set on fire, but the flames were put out after about two hours. Much of the ammunition in the third shed was rendered useless but, again, failed to explode. Had matters gone a little differently and, as might easily have happened, had exploding ammunition been flung across the harbour, the shipping must have suffered severely.

Retaliation was not long delayed. Between the 8th and 14th of February, night and dawn attacks on Dunkirk

¹ The day bombers at Dunkirk at this time were Sopwith 1½ Strutters (130 horse-power Clerget). For night bombing there were Caudrons (two 100 horse-power Anzani engines) and Shorts (250 horse-power Rolls-Royce engines).

killed sixteen and wounded thirty-six persons, but inflicted little material damage. On the 14th and on the 16th the docks at Bruges were again attacked, and on the latter day the German aerodrome at Ghisteltes was also bombed.

From the middle of February to the end of March there were few days when useful flying was possible. The menace of the German destroyers based on the Belgian ports was again made clear on the 17th/18th of March, when a sortie against the Dover barrage patrol and shipping in the Downs led to the destruction of the British destroyer *Paragon* and damage to the *Llewellyn*, as well as to the sinking of the s.s. *Greyhound*. A few days later it was known that another destroyer flotilla had arrived at the Belgian ports from Germany, and as it appeared that the Germans intended to follow up their success, special precautions were taken in the Thames and in the Dover Straits area.

Meanwhile, on instructions from Vice-Admiral Bacon, bombing attacks, in retaliation for the raids on Dunkirk and the French coast, were ordered against the seaplane base at the Zeebrugge Mole and against active aerodromes in Belgium. Night attacks by Short seaplanes were made on the 4th, 5th, and 6th of April on the Mole, when, in addition to many 65-lb. bombs, six of 520-lb. weight were dropped. It was learned during these attacks that when the first aircraft appeared over the port, the German destroyers put to sea and anchored about a mile off the end of the Mole. Vice-Admiral Bacon saw an opportunity to use some of his torpedo-carrying coastal motor-boats for attacks on the anchored destroyers and, on the night of the 7th of April, the destroyer *Falcon*, with four coastal motor-boats, set out. The Short seaplanes were sent out later, at fifteen or twenty minutes interval, and the operations were so planned that the motor-boats were four miles off Zeebrugge, ready to close the port at slow speed, as soon as the bombing began. The first Short seaplane pilot opened the attack at 11.15 p.m. with one 520-lb. bomb, and twenty minutes later 65-lb. bombs came from a second seaplane. A third appeared within ten minutes and, after dropping a 264-lb. and a 100-lb. bomb, attacked the Mole searchlights with machine-gun fire.

Meanwhile the motor-boats had quietly approached four German destroyers which were found lying in the Wielingen Channel, and had effected a complete surprise. Hits were made on the destroyer G.88, which was in a sinking condition when the motor-boats turned for home: the boats reached Dunkirk safely between four and five in the morning.

On the evening of the 20th of April the German destroyers again raided the Straits and shelled Calais and Dover, ineffectually, for some minutes. Soon after midnight, the British destroyer leaders *Swift* and *Broke* sighted the enemy vessels and, in a memorable action, the G.42 and G.85 were sunk. As a result of this disaster the German destroyers avoided the Dover Straits area for many months.

In April 1917 the Dunkirk air units were reorganized, following the dispatch of four naval fighting squadrons to reinforce the Royal Flying Corps. Arrangements were made for No. 1 Wing at St. Pol to administer also the seaplanes at Dover and Dunkirk. The Wing was made responsible for all naval co-operation, such as spotting the fire of monitors and naval siege guns on shore targets, and for aircraft reconnaissance and photography of the Belgian coast bases. No. 4 Wing, whose head-quarters was moved to La Panne, was instructed to provide offensive patrols and escorts, and was also made responsible for the protection from the air of surface craft. No. 5 Wing was charged with the duty of day and night bombing.¹

For bombing there was now arriving the Handley Page, which could carry fourteen 112-lb. bombs as compared with the Short Bomber's eight 65-pounders. The Handley Pages were first used for daylight patrols off the coast, and, on the 23rd of April, had some success. Three, each loaded with fourteen 65-lb. bombs, went out to search for five German destroyers reported off Ostend.

¹ No. 4 (Fighting) Squadron was transferred from Coudekerque (No. 5 Wing) to a new aerodrome at Bray Dunes (No. 4 Wing). No. 10 (Fighting) Squadron was moved from St. Pol (No. 1 Wing) to Furnes (No. 4 Wing). No. 5 (Bombing) Squadron moved from Coudekerque to Petite Synthe, and No. 7 (Bombing) Squadron from Petite Synthe (No. 4 Wing) to Coudekerque (No. 5 Wing), where it was amalgamated with the Handley Page Squadron.

The enemy vessels were found five miles off the coast and, although they broke formation when the Handley Pages attacked, one of the destroyers was stopped by direct hits and developed a list.

Three days later the Handley Pages were again in action with German destroyers off Ostend, but on this occasion the bombing inflicted no visible damage. One of the Handley Pages, venturing too far from the fighting escort, received bullets in the petrol tanks from an enemy single-seater and was eventually forced down on the water, where it came under fire from the coastal batteries. The pilots of two French flying-boats attempted to rescue the British crew. The first one landed alongside the Handley Page, took off the observer, who had been wounded, and got safely back to Dunkirk. The second French pilot was not so lucky. He had taken on board another member of the Handley Page crew, but he could not subsequently get off the water, and German motor-boats, from Ostend, captured the whole party. As a result of this misadventure, it was decided to restrict the activities of the Handley Pages to night bombing. At first, raids were confined to moonlight nights, but as pilots gained experience the attacks came to be made on any night when the general weather conditions were favourable.

The D.H.4 aeroplane, fitted with a 250 horse-power Rolls-Royce engine, made its appearance concurrently with the Handley Page, and was used for the re-equipment of No. 2 Squadron at St. Pol. Fully loaded, the D.H.4 could climb to over 20,000 feet as compared with a ceiling of approximately 15,000 feet for the Sopwith two-seaters, and photographs of the enemy defences and bases in Belgium were soon being taken from heights above 18,000 feet. As the supply of these aeroplanes increased, they replaced the Sopwith bombers of No. 5 Squadron and, from July 1917 onwards, the greater part of the day bombing was done by the D.H.4's.

The Bombardments of Zeebrugge and Ostend

Meanwhile the Vice-Admiral at Dover had, for some time, been preparing plans for a bombardment of the lock

gates at Zeebrugge which were a vital link in the communications between that port and Bruges, where the U-boats and destroyers were based. The destruction of the lock gates would make the canal tidal and probably sever connexion with Bruges. Direct hits from two fifteen-inch shells, it was calculated, would suffice to destroy the lock gates, but the difficulties in the way of effective bombardment were great. The Knocke battery (*Kaiser Wilhelm II*) could make good shooting up to a range of twenty sea miles, and, therefore, the monitor which was to be used as a back aiming mark would have to be anchored far out at sea to render her reasonably safe from the fire of the German guns. This, in turn, meant that the bombarding ships would be almost at their extreme range. Aeroplane spotting was essential because the bursts of the shells could not be located in any other way. Vice-Admiral Bacon calculated that 252 rounds would be required to ensure the probability of a hit on the lock gates, and as the rate of fire for each of the three available monitors (*Erebus*, *Terror*, and *Marshal Soult*) was one round a minute, the bombardment would have to go on for eighty-four minutes. A calm sea, weather conditions giving favourable winds to allow of the maintenance of a smoke-screen to protect the bombarding ships, a tide running along the coast so that the anchored monitors could keep their broadsides to the target, and the absence of low clouds which would prevent aircraft working, were the exacting essentials if the bombardment was to be made with a likelihood of success. Furthermore, to ensure surprise, the monitors must be in position before dawn, and there was the risk that, with all other conditions satisfied, morning mists might shroud the target from the view of the airmen.

Three times Vice-Admiral Bacon had to turn back from the enterprise because of a change in the weather, but, on the morning of the 12th of May, at 4.15 a.m., the monitors and their attendant ships were in position under conditions judged to be favourable. The ships, however, owing to the slow passage of the *Marshal Soult*, which had to be towed, arrived later than had been planned and the delay

was fatal. The first wireless-fitted aeroplane had been over the target from 3 a.m., but a ground mist had obscured the lock till 3.40 a.m. At this time the observer sent out a message that he was ready to begin, but it was not until 4.47 a.m. that fire was opened. A precious hour had been lost and matters were made worse because the two relieving Sopwiths had engine failure and did not arrive to take over the spotting from the first aeroplane which had to turn for home, through petrol shortage, at 5.30 a.m. Up to that time, however, forty-five corrections were signalled from the air, and the *Erebus* and *Terror* had got directly on their target, but many of the shells, it was reported, failed to explode. The monitors continued to fire without air observation up to 6 a.m., when a change of wind ended the operation. It is of interest that the monitors bombarded at a range of 26,200 yards, and that the visibility from the ships was never more than 4,000 yards. Up to the time the firing ceased enemy aircraft were inactive, and a patrol of Sopwith triplanes, in the area of the monitors, passed without incident. A second patrol, however, of seven Sopwith 'Pups' of No. 4 Squadron, was met by a formation of Albatros fighters near Zeebrugge at 6.25 a.m. and, in a sharp fight, three of the German aeroplanes fell into the sea and two others were reported shot down. A third patrol, a little later, again found opposition and, after losing one of its number, shot down a seaplane which crashed in Ostend harbour. This activity over the Belgian ports prevented serious molestation, by aircraft, of the British ships as they withdrew, and two German seaplanes which slipped through with the evident intention of making a bombing attack, were met and driven off by the second of two patrols of fighting seaplanes which escorted the British ships on their homeward journey.

The results obtained proved disappointing. Air photographs revealed that nineteen shells had exploded within a few yards of the target, but that the gates had not suffered any damage. Although considerable damage was inflicted on buildings in the neighbourhood of the target and went some way to soften the failure, the value of Zeebrugge as a U-boat and destroyer base had not been

impaired. The incidence of the shots and the conditions which prevailed, including the advantage of surprise, would seem to show that, had the monitors been ready to fire when the aeroplane observer gave the signal, or, alternatively, had their fire been reported from the air throughout, the chances of a direct hit were high.

Vice-Admiral Bacon next turned his attention to the dockyard at Ostend, a larger target, but one that was flanked by houses, which must be avoided. After earlier attempts, made abortive by the weather, the *Erebus* and *Terror*, with destroyers and auxiliary craft, set out on the evening of the 4th of June. To cover the operation in the direction of the Thornton Bank and the Schouwen Bank, Commodore Tyrwhitt went out with the Harwich Force, and, early next morning, he intercepted two German destroyers, one of which, the *S.20*, he sank. In the later stages of this destroyer action, German seaplanes from Zeebrugge took part and, coming down on the water, they picked up and carried home one officer and seven men of the crew of the *S.20*.

From 16,000 feet above Ostend, part of the destroyer action was watched from the aeroplanes which were in position ready to direct the fire of Vice-Admiral Bacon's monitors. There were two D.H.4 aeroplanes for spotting, escorted by two others and by two Sopwith 'Pups'. In addition, to prevent German aircraft spotting for the shore batteries against the ships, or from making direct bombing attacks on them, there were two fighter patrols in the neighbourhood.

The air observer's signal that he was ready was made at 3.22 a.m. and fire was opened within a few minutes. To avoid a possible initial shelling of the town, the monitors were ranged on a point about a 1,000 yards short of the eastern boom, and the guns were not lifted on their target until the line and direction had been given as correct. When the range was lengthened, fire was at once reported on the target, and a central hit was quickly signalled. Soon after fire was opened a German kite balloon ascended 5,000 feet behind Ostend presumably to direct the enemy coast batteries on the bombarding ships.

One of the patrolling pilots in a Sopwith 'Pup', diving from 18,000 feet, shot the balloon down. Meanwhile numerous enemy smoke screens had been started and, by 3.45 a.m., the docks and the surrounding country had become obscured. The smoke spread until it covered about ten to fifteen square miles, including the entire harbour, and, at 4 a.m., Vice-Admiral Bacon judged it was useless to continue. Of 115 rounds fired by that time, thirty-six had been spotted from the air, and photographs taken later in the day showed that at least twenty shells had fallen on the docks. One object of the bombardment, the infliction of damage on the destroyer repair shops, had been attained. It was also revealed by U-boat prisoners, taken shortly afterwards, that the bombardment led to the sinking in the harbour of the submarine *U.C.70*, as well as an armed trawler, and that three destroyers which could not get out of harbour in time were damaged. The *U.C.70* had been lying alongside a petrol lighter which was exploded by a direct hit; the U-boat was afterwards raised and repaired at Bruges.¹

The Belgian Coast Barrage

For some weeks after this attack on Ostend the weather conditions provided no suitable opportunity for a renewal of the bombardments and, towards the end of July 1917, Vice-Admiral Bacon decided to reinstitute the Belgian coast barrage.² This barrage, as in the previous year, was to consist of a twenty-three mile line of net mines, supplemented by deep minefields, parallel with the Belgian coast between Zeebrugge and Ostend. The laying of the net barrage was begun on the 25th of July. While the ships were assembling on the previous evening, air patrols were maintained, from 5 p.m. until dark, over the Dunkirk Roads, but no German aircraft appeared. From the 25th to the 27th inclusive, when the barrage was being put down, there were fighting patrols, by formations of five to seven Sopwith 'Pups' or 'Camels', to protect the ships against attack from the air. In this they succeeded. On

¹ German records confirm the sinking of the *U.C.70*. She was ultimately destroyed in the North Sea in August 1918.

² See vol. ii, pp. 431-2.

the evening of the 25th a German seaplane, which appeared over the Fleet, was driven off and eventually shot down on the sea by Sopwiths of No. 4 Squadron. Next evening there was a clash between a patrol of 'Camels' and a formation of Albatros fighters, with the loss of one aeroplane to each side. On the 27th the enemy attempted an attack on the ships with torpedo-carrying seaplanes, four of which, with one fighting seaplane as escort, were seen approaching from Ostend by five Sopwith 'Camel' pilots patrolling over the ships. The 'Camel' pilots attacked, the enemy formation scattered, and the German pilots turned back to their base: one of the enemy seaplanes crashed in the sea off Ostend.

After the barrage had been laid, a strong patrol was maintained by monitors and destroyers to the north-westward of the nets to protect the net drifters and to prevent the sweeping of the minefields. At dawn each day three D.H.4 aeroplanes, one of which carried wireless, flew over the area in advance of the patrolling ships to give warning if German forces were lying in wait. During the remainder of the day until dusk, fighting formations, usually of five or six 'Camels' or 'Pups' on high patrol (above 17,000 feet) and three on low patrol (under 7,000 feet), were sent out periodically. The aeroplane pilots, especially those on low patrol, had to face the risk of loss if they were compelled, through engine failure or other cause, to alight on the sea out of sight of surface craft.¹

When these aircraft patrols were first instituted, there were a fair number of combats, but, during August and September 1917, the German pilots paid little attention to the barrage line. In October, however, their interest revived and many bombing attacks against the ships were attempted. On the 27th one such attack was made with twenty aeroplanes, and casualties were inflicted among the ships' crews. Next day an attack by an electrically controlled motor-boat, called a *Fernlenkboot*, was made on the

¹ Flight Commander A. J. Chadwick, forced down on the 28th of July, was drowned. In a bomb raid on the Zeppelin sheds at Evere, in October 1916, this officer had been shot down, but had eluded capture and, after many adventures, had eventually got through to Holland.

monitor *Erebus*. In the forepart of the *Fernlenkboot* was placed a charge of high-explosive, and in the stern was a drum of many miles of insulated cable by which the boat could be directed electrically from the shore. The crew started the boat and then left, after which the observer in a seaplane, by wireless signal to the shore station, indicated what helm was to be given the boat to direct it on its target. These boats had, twice before, been run at a patrol, but on the first occasion the motor-boat had been sunk by the *M.23* and, on the second occasion, had failed to reach the patrolling vessels.¹ In the attack on the *Erebus* on the 28th of October the German seaplane observer played his part well, and the *Fernlenkboot* hit the monitor amidships, where it automatically exploded. The debris thrown by the explosion killed two men and wounded fifteen, and the bulge of the monitor was damaged, so that she had eventually to be sent to Portsmouth for repair. After one more attack of this kind, in which the *Fernlenkboot* was sunk by a pom-pom shell from the destroyer *North Star*, the Germans abandoned this method of attack. The reasons they gave were that no large warships approached the Belgian coast and that it appeared hardly worth while to send the motor-boat against smaller craft whose power of rapid manœuvre rendered the chances of success very small.

By this time the air patrols in defence of the Fleet had had to be curtailed owing to a depletion of the pilot strength at Dunkirk. In the five weeks previous to the attack on the *Erebus*, sixty-one pilots had been struck off the strength through sickness, injury, or transfer home, and no more than nineteen new pilots had arrived to replace them. The German attacks on the barrage-line could not, therefore, be watched with any degree of continuity and the ships were often bombed. Several of the electric-battery cases used with the electrical-contact net mines were destroyed from time to time, and this led to their being placed in mine cases which were then sunk

¹ The first boat of this kind had been run against the pier at Nieuport on the 1st of March 1917. Fragments of the boat were salvaged and sufficed to reveal the principles of the design.

to the bottom of the sea, a procedure which proved effective, but highly inconvenient.¹

Bombardments of Ostend

The monitors of the barrage patrol had orders, when the weather and other conditions were favourable, to bombard the dockyard at Ostend, the harbour at Blankenberghe, and the Mole at Zeebrugge. Arrangements were also in being for a set shoot on these targets with aircraft co-operation, when the conditions made success likely. Set bombardments of the dockyard at Ostend, with aeroplane co-operation, were attempted on the 4th and 15th of September, but they failed chiefly owing to the effectiveness of enemy smoke-screens and to bad wireless communication. On the 22nd of September, however, there was an appreciable success. The captain of the *Terror*, finding the weather calm and the visibility good, signalled for spotting and fighting aircraft to be sent to Ostend. Four D.H.4's and three Sopwith 'Camels' were sent out, and the observer in one of the D.H.4's was ready to spot the fire at 6.25 a.m.² Fire was opened and, corrected from the air, was soon on the target. The German batteries, 'Tirpitz' and 'Deutschland', retaliated and, with the help of enemy seaplane observation, began to drop shells within two dozen yards of the monitor. There were low cloud banks, but the German seaplane was found by a 'Camel' patrol and forced down on the water, whence it was salvaged by the British destroyer *Nugent*. A formation of seven enemy seaplanes now came up and, in a brief fight, the two remaining 'Camels' of the British patrol forced two more seaplanes down, one of which crashed and was wrecked.

Meanwhile the bombardment of Ostend continued, and although twelve smoke screens were put up they did not obscure the target, nor did bursts, artificially produced in the outer harbour, deceive the air observer. At five minutes to seven, by which time the *Terror* had fired thirty-five rounds from her 15-inch gun, the wind

¹ See *The Dover Patrol, 1915-1917*, by Admiral Sir Reginald Bacon, vol. i, p. 171.

² A high patrol of five Sopwith 'Camels' and a low patrol of three also covered the area.

freshened and the monitor withdrew. Air photographs showed that considerable damage had been done. One launching slip had been destroyed and others damaged, and a floating dock, on which were a destroyer and a submarine, had been sunk, while one of the lock gates had suffered so that the basin had been drained to low-water mark.

Three days later the *Terror* tried again, but the enemy had profited by his experience, and started an effective smoke screen within a few seconds of fire being opened. Thirty-one rounds were fired with the help of approximate corrections from the air, and the result was that a machine-shop was wrecked and the floating dock was further damaged. As the monitor withdrew, four German two-seater seaplanes, escorted by two fighting seaplanes, came out from Zeebrugge, and were engaged by two patrolling Sopwith 'Camels' (pilots, Flight Commander R. Graham and Flight Sub-Lieutenant L. H. Slatter). Each 'Camel' pilot shot down one of the enemy, a two-seater and a fighter. The latter collapsed on the water, but the former landed under control, and one of its occupants, wounded, was taken off by another German two-seater which landed alongside. The 'Camel' pilots emptied their remaining ammunition into this seaplane, which could not, apparently, get off the water again. Flight Commander Graham, whose oil-tank had been shot through, had to come down on the water in Dunkirk Roads: he was picked up, and his aeroplane was salvaged by a destroyer directed to the spot by his companion pilot.

Two further attempts to bombard Ostend in October—on the 20th and 21st—were foiled by smoke screens, and another, on the 19th of December, failed because the aircraft spotting arrangements broke down. The effect of these bombardments of Ostend, apart from the damage inflicted, was to restrict the use of the port as a destroyer station and repair base.

A Projected Landing¹

Vice-Admiral Bacon had, from the time of taking command of the Dover Patrol, concerned himself with plans

¹ See also Ch. V, pp. 138, 147, and 150.

to facilitate a landing of troops to wrest the Belgian coast from the enemy. What could be done depended on the progress made by the Allied left flank in France and Belgium. After many earlier disappointments, it seemed that the opportunity would come in 1917, in conjunction with the British offensive in Flanders, and Vice-Admiral Bacon pushed ahead with his preparations. By the summer of 1917 his arrangements had been completed, but as the long-drawn-out battle of Ypres trailed to its conclusion, hope drooped, and, by October, the project had been abandoned. Part of the aircraft work in the preparations merits a brief mention for its general rather than its particular interest. The places chosen for the landings of the military force were three beaches, a mile apart, between Nieuport and Middelkerke. The troops were to be landed off long pontoons (500 feet by 30 feet beam), which were to be pushed into position by monitors. Air photographs of these beaches, taken at low water, indicated that they sloped unevenly, and there appeared to be a danger that the pontoons, which were wedge-shaped, might ground on ridges with the surrounding water too deep for the troops to get ashore. To avert this danger, which would jeopardize the success of the operation, it was imperative that the beaches should be closely surveyed and this could only be done from the air. The method adopted by Vice-Admiral Bacon was based on the fact that as the tide fell on a calm day the line of water, visible from the air, formed, in effect, a series of contours along the beach. From air photographs taken, at, say, each foot of fall in the tide, from high to low water, it would be possible to plot the whole beach with sufficient accuracy. It was unnecessary that the timing of the photographs should be so exact as to ensure one-foot contours. So long as the time when the photographs were taken was carefully noted, intermediate positions could be calculated. In a preliminary survey, to get the rise and fall of the tide curves along this stretch of coast, a submarine was sent to lie on the bottom off Nieuport for twenty-four hours and the height of water above her hull was continuously registered from readings on the depth gauge.

The main photographic survey of the beaches was made by No. 2 Squadron on the 2nd of July when, from 11.25 a.m. to 5.36 p.m., batches of photographs were taken at intervals of twenty minutes. So that the attention of the enemy should not be unduly attracted to the vital beaches, other photographs were taken east of Ostend. From the air photographs, charts and sections of the beach were compiled by a scientific officer on the Vice-Admiral's staff. To check the accuracy of this method of survey, an experiment was tried. Two surveys were made of a comparable section of beach near Dunkirk, one by air photography and calculation, the other by direct observations. The two independent results coincided almost exactly. 'It was a good performance', says Admiral Bacon, 'to deduce the slope of the beach to within an accuracy of six inches from photographs taken 14,000 feet up in the air.'¹

Naval Air Co-operation in the Flanders Offensive

The Flanders offensive brought the centre of activity on the Western Front adjacent to the Dunkirk air base, and the naval air units were called upon to give a helping hand to the Royal Flying Corps, mainly in the direction of day and night bombing and of fighting. In the early summer of 1917, before the British offensive opened, the enemy airmen, intent on reconnoitring, photographing, or bombing the British back areas, developed a habit of making their approach by sea. The fighters of No. 4 (Naval) Wing, therefore, had been allotted patrol areas off the coast to a point north of Ostend.

The battles of Ypres opened on the 31st of July, a few days after Vice-Admiral Bacon had re-instituted the mine-barrage off the Belgian coast, and air protection for the Fleet now became, as has been told, the first consideration of the Dunkirk fighting squadrons. This was purely defensive work which absorbed the major part of the fighting

¹ *The Dover Patrol, 1915-1917*, vol. i, p. 237. An example of the clarity of the air photographs may be quoted. On prints made from plates exposed over the seaplane base at Ostend at this time, from a height of 17,000 feet, the black crosses on the wings of a seaplane outside the sheds are clearly visible.

strength. The offensive patrols, over land, had to be curtailed, and, although the seaward patrols could still watch for enemy formations using the sea approach to the Ypres area, interception became a secondary duty.¹

The help given by the Dunkirk fighters in the land operations, therefore, was confined to occasional pre-arranged offensive sweeps, and to attacks on German artillery aeroplanes under a special scheme. This—known as the Wireless Interception Scheme²—was put into use along the front of the Fourth Army—which had relieved the French in the coastal area—as it was in the other British Armies. A ground station had been set up in the Fourth Army area south-west of Nieuport, to signal to patrolling aircraft particulars of enemy aeroplanes working along the front. At the request of the army this branch of the offensive against the artillery aeroplanes was undertaken by the squadrons of No. 4 (Naval) Wing.³ The scheme was put into force on the 9th of August when arrangements were made for one Flight from each squadron to be in immediate readiness to go up on receipt of a message from the Army Station. When a message came, the leader flew over the Station to learn what was the latest position of the enemy aircraft. The method of conveying this information was simple and effective. The area opposite the Fourth Army front was divided into three numbered sectors. An oblong grid, laid out near the Wireless Station, was divided to correspond with these, and a white disk sufficed to indicate in which sector the enemy aeroplanes were working. An arrow of white strips gave further indication of their bearing from the station, and bars on either side of the arrow told of their height. In August and September, sixty patrols were sent out in answer to messages from the ground signal station, and

¹ In three months from June to September 1917, forty-six offensive patrols over land were made compared with 289 in the neighbourhood of the barrage-line.

² See vol. iii, p. 319.

³ At this period Nos. 3, 4, and 11 (Naval) Squadrons. At the end of August 1917 No. 11 (Naval) Squadron had to be disbanded because of the shortage of pilots. No. 9 (Naval) Squadron rejoined the Dunkirk Command from service with the R.F.C., at the end of September, and Nos. 1 (Naval) and 10 (Naval) from similar service in November.

although, as a result, no more than two German artillery aeroplanes were definitely destroyed, the work of directing the German guns from the air was appreciably curtailed.

Not much of the fighting strength of the Dunkirk Naval Air Service units could be diverted to help the Flanders offensive,¹ but something like the maximum strength of the bombing squadrons was available. The view at the time was that bombing by day, when the raiding aircraft were seen over a wide area, created more fear than night attacks and was more likely to induce the enemy to withdraw fighters to protect his vulnerable back areas. It could be argued, about night bombing, that it was not much use sending up fighting aircraft to search the darkness for the raiders, but no such argument could be used to quieten demands which would arise for protection against attacks by day. The main object of day bombing, therefore, was to induce the enemy to divert his fighting strength from the important area of operations.² Day attacks had to be made from great heights owing to the efficiency of the German anti-aircraft gun-fire, and, therefore, against definite small targets such as railway junctions or ammunition dumps, they could seldom be delivered with an accuracy sufficient to make them of direct military value. Although its effect on morale might be less powerful, night bombing had the advantage that a high performance aeroplane was not essential (about three times the weight of bombs per horse-power was carried by the night-bombers), and the bombers, less subject to accurate gun-fire, could attack from low heights. There were the further advantages that effective targets were multiplied at night, because air observation had led to all important troop movements being made in the hours of darkness, and

¹ It should, however, be remembered that five naval fighter squadrons from the Dunkirk Command were, at this time, attached to the Royal Flying Corps on the Western Front.

² Cf. the immediate effect of the German daylight attacks on London on the 13th of June and the 7th of July 1917. Pending the formation of three special day fighting squadrons, first No. 56 (S.E.5) Squadron (21st June) and then No. 46 ('Pup') Squadron (10th July) were temporarily withdrawn from France to England. In addition No. 66 ('Pup') Squadron was sent to Calais to patrol the route of the raiders. See pp. 134-5 and 152-5.

also that attacks on enemy aerodromes would be made when the aeroplanes were in their sheds.

The naval bombing squadrons available were Nos. 5, 7, and 7a¹ of No. 5 (Naval) Wing. By the middle of August 1917, the Sopwiths of No. 5 Squadron had been replaced by D.H.4's. At this time Nos. 7 and 7a Squadrons possessed between them twenty Handley Pages. Each night-bombing Handley Page could carry an aggregate weight of 1,344 to 1,792 lb. of bombs, and its two engines consumed about fifty-four gallons of petrol per hundred miles. To carry a similar weight of bombs six day-bombing D.H.4's were necessary, and their combined petrol consumption for each hundred miles was 120 gallons. In personnel, the D.H.4's required six pilots and six observers as compared with one pilot and two observers in a Handley Page.

In July, when the final preparations for the Flanders campaign were being made, the targets for the naval day-bombers were, in the main, German aerodromes. These targets were chosen to help the Flying Corps offensive and, apart from the material damage caused, the increasing opposition to the naval air attacks made it clear that some of the German fighting strength was being diverted for aerodrome defence. Additional escorts for the D.H.4's were provided by Bristol Fighter formations of No. 48 Squadron of the Royal Flying Corps and, so long as close formation was maintained, the enemy fighters were not unduly aggressive, preferring to await the opportunity to pounce on stragglers. The night bombing, in July, was chiefly directed against the railway junctions and sidings at Ghent, Ostend, Thourout, &c., and against the electricity works at Bruges and Zeebrugge.

When the battle of Ypres opened, at the end of July, the weather stopped bombing, and not much could be done until the middle of August, when attacks were resumed on the railway junctions and aerodromes. In addition to day and night bombing, dawn attacks were made from low heights (50-100 feet) on aerodromes and troops by Sopwith 'Camels' of No. 3 (Naval) Squadron.

¹ No. 7a was formed from No. 7 in July 1917. It was the nucleus of No. 14 (Naval) Squadron, formed on the 9th of December 1917.

Two examples of the bombing may be quoted. In the afternoon of the 16th of August a formation of nine D.H.4's, with an escort of six R.F.C. Bristol Fighters, first dropped three 65-lb., one 50-lb., and thirty 16-lb. bombs, from a height of 13,000 feet, on Sparappelhoek aerodrome near Thourout, and then flew on to Ghisteltes aerodrome, where the remainder (nine 65-lb., two 50-lb., and forty-eight 16-lb.) were dropped. As the attack was made from a height, many bombs of small weight were carried, rather than a few heavy ones, to increase the chances of direct hits, but, as has been told, the main object of this day bombing was to induce the enemy to divert fighting aircraft to defence.

On the same night—the 16th/17th August—fourteen Handley Pages set out about midnight for the railway system at Thourout. There was no moon, but the night was clear so that the targets were defined and many hits on the two junctions and on the railway lines were reported. Early in the attack an ammunition dump was set on fire, and the subsequent explosions were heard and seen from the British lines throughout the night. In all, 189 bombs, of a total weight of over nine tons, were dropped by the Handley Pages on the Thourout railways.

By the end of August the enemy air opposition to the day bombing had stiffened, and, on the 3rd of September, so effective was it that an attempted attack on Varsenaere aerodrome was frustrated. Groups of fighters repeatedly dived on the eight D.H.4 bombers and on the Bristol Fighter escorts and succeeded in scattering the British formations. Two enemy fighters were destroyed, but all the British pilots made a safe return.

To counter this opposition offensive sweeps were tried. The opportunity came in conjunction with air attacks on the dockyard at Bruges, on which the bombing, day and night, was temporarily concentrated during a lull in the military operations in Flanders. This dockyard bombing was made in co-operation with the abortive bombardment of Ostend on the 4th of September.¹ Between the 2nd and the 5th of September eighteen tons of bombs were

¹ See p. 89.

dropped on the Bruges docks. The offensive sweeps, notably on the 4th, when the bombardment was made, failed to bring the enemy fighters to combat.

It was seen, however, that when fire was opened by the monitor, the enemy torpedo craft steamed out of harbour and anchored off shore. It was therefore decided that when the next bombardment was made D.H.4 bombers should be in the air ready to attack the German vessels. On the afternoon of September the 15th, when the *Terror* and *Erebus* fired on Ostend, eleven D.H.4's were in the air. When the shipping began to move and concentrate, the leading pilot gave the signal to attack, and nineteen 65-lb., two 50-lb., and eighty-four 16-lb. bombs were aimed at the ships. Two hits were made, one on an armed trawler and the other, with a 65-lb. bomb, on a destroyer.

Following this temporary bombing diversion to objectives of purely naval interest, attacks on military targets were resumed in conjunction with the battle of the Menin Road Ridge. Night flying was impossible during the 19th/20th of September (the allotted objective was Thourout), but in the afternoon of the 20th, D.H.4's of No. 5 Naval Squadron, escorted by Bristol Fighters of No. 48, attacked the aerodromes at Aertrycke and Sparappelhoek. In the early hours of September the 21st, five tons of bombs were dropped from eight Handley Pages on the junctions at Thourout, and, later in the morning, eleven D.H.4's repeated an attack of the previous day on the two German aerodromes north-east of Thourout. Fifteen German fighters, waiting for the D.H.4's, withheld their attacks until the bombers had broken formation over their targets. They then dived and succeeded in preventing the bombers from re-forming. In a series of individual combats on the homeward journey a D.H.4 pilot was wounded and one of the escorting Bristol Fighters was shot down. During the night of the 21st/22nd of September nine Handley Pages dropped six tons of bombs on the junctions at Thourout and Cortemarck, and caused extensive fires in the station buildings of the latter town.

For the next daylight attack—made on Varssenaere aerodrome on the 24th—the bombers were given an escort

of eight naval 'Camels'. The visibility was exceptional and many direct hits, from among the nineteen 65-lb. and eighty-four 16-lb. bombs, were reported. The escorting 'Camels' and the bombers had to fight continuously, but there were no decisive combats. On the 25th the target was Sparappelhoek aerodrome and the fighting escort was further strengthened. Six R.F.C. Bristol Fighters accompanied the D.H.4's and ten naval 'Camels' made an offensive sweep along the route. The British formations were closely maintained and the numerous enemy pilots kept at a distance. That same night, under adverse conditions of weather, nine and a half tons of bombs were dropped by the Handley Pages on the Thourout-Cortemarck-Lichtervelde railway triangle. After this attack, naval bombing was concentrated against the aerodromes from which German squadrons were known to be developing their new night-bombing campaign against England.

The German Bombing Squadrons.

The bombing attacks which began by daylight in May 1917 on the south-eastern counties of England, and reached London in June and July, were made by the German No. 3 Bombing Squadron. This squadron had been formed in March 1917 with four Flights, each of six twin-engined Gotha aeroplanes. Two Flights were stationed at the airship base at Gontrode and two at St. Denis Westrem. The squadron was at full strength—six Flights—by July.

After the June raid on London, when the casualties were 162 killed and 432 wounded, the Dunkirk air units were given the task—additional to their usual duties—of intercepting the German bombing formations on their homeward flights from England. When Harwich and Felixstowe were under attack on the 4th of July, Dunkirk was informed and fighters were sent up. One Flight of five 'Camels' met and fought the raiders north-west of Ostend, but the combats were apparently indecisive. Fighting formations were sent up from Dunkirk on the 7th of July, when it became known that London was again being attacked, and also on the 22nd, when news was received that

the bombers were over Harwich, but on neither occasion were the enemy aeroplanes found. The threat of the Dunkirk fighters led to escorts being provided to meet the German bombing formations on their homeward journeys.

There was comparative quiet in August, but in September a new series of night attacks on England was begun, culminating in a week of intensive effort at the end of the month. As a counter-measure the bombing of the St. Denis Westrem and Gontrode aerodromes, by Dunkirk and by Royal Flying Corps squadrons, was ordered. On St. Denis Westrem, between the 27th of September and the 1st of October, eight tons of bombs were dropped by Dunkirk squadrons. On the night of the 30th a shed on the aerodrome was fired by a direct hit, and was gutted. Following these attacks, two Flights of the German bombing squadron were transferred from St. Denis Westrem to Mariakerke, west of Ghent, and two others from Gontrode to Oostacker, north of Ghent.

The total of bombs dropped by the Dunkirk squadrons (available, eighteen D.H.4's and sixteen Handley Pages) in September weighed over eighty-seven tons.

There was retaliation against Dunkirk. The first attack began about 8 p.m. on the 24th of September on the Naval Air Service depot at St. Pol. Aided by a parachute flare, which burned for several minutes, the German pilots got many hits. The pump-house, which supplied the water for the fire mains, was put out of action and no hose could be used when the engine repair-shed was set on fire by an incendiary bomb. About a thousand men were organized to save material from the adjacent buildings, but in spite of their work, great damage was caused. The engine repair-shop, saw-mill, machine-shop, spare engine-shop, engine packing-shed, and the drawing and records offices were destroyed. In the engine packing-shed one hundred and forty engines were lost.¹ The raids on the depot were repeated each night for a week and ended with a severe attack on the 1st of October. Between 9.30 p.m.

¹ 83 (130 h.p.) Clerget; 10 (110 h.p.) Clerget; 37 (80 h.p.) Le Rhone; 5 (150 h.p.) B.R.1; 1 (200 h.p.) B.H.P.; 1 (90 h.p.) Rolls-Royce; 1 (250 h.p.) Rolls-Royce; and 2 (275 h.p.) Rolls-Royce.

on this evening and 2 a.m. on the 2nd, about one hundred bombs were dropped. It is now known that the attack on this night was made by twenty-two Gothas and by two smaller-type bombers, all belonging to No. 1 *Bombengeschwader*, and that the weight of bombs dropped was approximately ten tons.¹ A direct hit on the aircraft erecting shop started a fire which consumed twenty-three aeroplanes (three D.H.4's, ten 'Camels', eight Triplanes, and two Sopwith two-seaters), eighteen sets of instruments, and three engines. Once again, luck was with the attackers: the water-mains were buried five feet below ground, but a chance hit put them out of action and there was no water to fight the fire. Three other sheds were set on fire, and gutted, as was a Bessonneau hangar erected on the site of the engine repair-shed which had been destroyed in the raid a week earlier. In these sheds six engines were lost. Elsewhere thirty aeroplanes suffered minor damage.

The German airmen had concentrated on one important target and, with luck on their side, had done their work thoroughly. All departments of the depot went out of action and repair work came to a standstill. It was impossible, for some time, to make good the losses in engines, and the efficiency of the naval squadrons in France, including those attached to the Royal Flying Corps, was temporarily impaired.

The supply and repair system had to be reorganized. The enemy had left no doubt about the weakness of concentrating supply and repair activities in one large works within range of bombing aircraft. The sections of the depot were therefore decentralized. Work was begun on the construction of a new aeroplane supply depot at Guines, near Calais, under the energetic direction of Lieutenant-Commander Warwick Wright, R.N.V.R., and, meanwhile, an acceptance park for new aeroplanes and for the repair of damaged aircraft, was established at Dover. An engine repair-shop and depot was temporarily

¹ During the week September the 27th to October the 3rd, the two German bombing squadrons stationed in Flanders, Nos. 1 and 3, dropped a total of 123 tons of bombs, by night, on Dunkirk, Calais, St. Omer, and Poperinghe.

set up at the frontier aerodrome of Bray Dunes, and small workshops, for aeroplane repairs, were taken over at Malo les Bains and Rosendael, near Dunkirk. Spare aeroplanes, and men skilled in major repair and construction work, were distributed from the depot among the active squadrons.

While the German bombers were making their intensive effort to wipe out the naval aircraft depot, the Handley Pages were concentrating on a more difficult target. Night bombing attacks, at maximum strength, had been ordered by Vice-Admiral Bacon with the object of destroying the lock gates at Zeebrugge. On the 27th of September and during the four nights from the 29th to the 2nd of October, two hundred and twenty bombs of 65-lb., 112-lb., or 250-lb. weight, (12½ tons) were aimed at the lock gates, but the gates escaped destruction, although several of the bombs fell near enough to damage them.

One of the results of the September night raids on London was a Government decision for counter-attacks against military objectives in Germany. Arising out of this decision, a bombing wing was established in the Ochey area and formed the nucleus of the command which later became the Independent Force. A secondary result was the allotment of objectives in the Cologne neighbourhood to the Dunkirk Handley Pages. An attempt was made on the evening of the 28th of October when nine Handley's set out to bomb the station and military barracks at Cologne. East of Brussels, the weather conditions became unfavourable and six of the pilots turned to Antwerp and dropped their bombs on the Cockerill Works at Hoboken, and on the railways and docks. Two others attacked Bruges docks and trains south-west of Ghent. The remaining pilot (Flight Lieutenant R. G. Gardner) persisted towards his objective, but, hampered by rain, eventually dropped his twelve 112-lb. bombs on a lighted factory east of Duren. This pilot, on the return journey, had to fly 'blind' through the clouds for 2¼ hours, but he made a good landing on the small, unlighted aerodrome of a Flying Corps squadron after being in the air seven and a half hours.

Down to the end of the year, the weather was too bad for anything more than sporadic short-distance bombing. Opportunity was taken during this period of restricted activity to give the Dunkirk fighting squadrons a rest in England: they were sent, two at a time, to Dover or Walmer. There was also, in this winter period, some reorganization. The seaplane unit was disbanded and its duties of anti-submarine patrol were taken over by No. 17 (D.H.4) Squadron, newly formed for this work. The former fighting squadrons—Nos. 6 and 11—which had been broken up in the summer of 1917 owing to a shortage of pilots, were revived as D.H.4 day-bombing squadrons. No. 6 was equipped at Dover and crossed to Petite Synthe in January 1918: No. 11 began to form in March 1918.

Frequent reference has been made to the reconnaissance and photographic work of the Dunkirk air squadrons, but it has, perhaps, not been made clear how continuous and how important that work was. The information revealed by the air photographs, and brought back by the pilots and observers, was sifted and co-ordinated in the naval air intelligence section at Dunkirk, under the direction of Lieutenant-Commander O. G. G. Villiers. It provided material for a treatise, with maps and illustrations, of the whole range of intricate German defence systems from Nieuport to the Dutch frontier, with the detailed characteristics of the coast and inland batteries, the general topography, and much miscellaneous information about such matters of military importance as the slopes of the beaches, locations and heights of sea walls, &c. This material, amended in minor details in the Intelligence Department of the Naval Staff at the Admiralty, was printed for the guidance of all those concerned with the dispositions of the enemy in the Belgian coast sector, and the book formed the basis for many of the activities of the Dover Patrol and of all the actions directed against the enemy in the Belgian coastal area. Three times during the war, in April 1916, March 1917, and May 1918, the book was printed, and in the intervals between publication

its matter was kept up-to-date by the constant air work of the Dunkirk Command.

A review of the general activities of the Dunkirk air units throughout 1917 and early 1918 reveals many features of interest to the student. The naval squadrons were operating on the flank of the armies, which were engaged in a critical struggle. It was natural that Sir Douglas Haig should look to Dunkirk for all the help he could get in furtherance of his land operations. The Dunkirk air squadrons had certain work to do in co-operation with the naval forces against the Belgian coast, but when the essentials had been provided for, there remained, from time to time, surplus pilots and aeroplanes, and it is not unfair to conclude that the conviction of the Commander-in-Chief was that this surplus energy should be directed against military objectives to strengthen his air offensive against the enemy.

On the other hand, there were in Belgium bases of great, even vital, naval interest. One of these, Bruges, the most important, could be attacked only from the air. Let us consider the development of this base. On the outbreak of war, Bruges, as a maritime port, was still young, but its possibilities were enormous and, soon after the occupation, the Germans began the enlargement of the port for war purposes. In 1915 three submarine shelters were built, floating docks constructed, and great stores of mines and ammunition were collected and housed in the dock warehouses and in specially built sheds. Towards the end of 1916 the Germans decided to make Bruges an Imperial Dockyard with Ostend and Antwerp as dependent, subsidiary bases. Under this scheme the large pre-war warehouses at Bruges were turned into dockyard workshops, and other accommodation had to be found for the stores of explosive material. 1917 was, therefore, a year of widespread activity, during which the whole face of the harbour was changed.

In the winter of 1916-17, bombing by naval aircraft began to be effective, and as the year 1917 progressed and the weight and number of the bombs grew, we find the Germans continually modifying their building plans.

Sheds and shelters of a standard type of brick and ferro-concrete, designed as bomb-proof, became out-of-date almost before they were built, owing to the increasing effectiveness of the heavy-weight, delay-action bombs. More ferro-concrete was used until, by the end of 1917, structures wholly composed of this material were being built. Thus the duel, in naval warfare, between armour and shell, may be said to have had its counterpart in this race between ferro-concrete and the bomb. By the spring of 1918 the Germans had decreed a standard thickness of two metres for the roof and one metre for the walls of protected buildings.

It is unnecessary to set out in detail the vast amount of construction which took place in 1917. One example will suffice to illustrate the influence of the bomb. In August 1917 the first pile-driving operations began in the North Darse, at Bruges, for a group of ferro-concrete submarine shelters. The design was, in effect, a roofing over, with bomb-proof covering, of a large stretch of the basin, the rows of columns on which the roof rested forming separate bays in which the submarines could lie. Eleven or twelve bays were designed and nine had been completed when the war ended. Rammed-in wooden piles formed the foundations; upon these rested horizontal ferro-concrete beams supporting the long lines of ferro-concrete columns bearing in their turn horizontal beams. The roof, which was two metres in thickness, was not solid ferro-concrete and did not, therefore, conform with the latest German design. On 0.80 metre ferro-concrete beams, laid transversely and touching one another, was a layer of ferro-concrete, 0.60 metre thick and doubly re-inforced. Then came an 'elastic stratum' of 0.30 metre of gravel, with another layer of 0.30 metre of doubly re-inforced concrete to serve as a detonating platform. No roof of this construction, nor one of the same thickness of solid ferro-concrete, was hit by a bomb during the war. A few bombs of 1,600 lb. weight were dropped from August 1918 onwards by British aircraft, but whether the German buildings could have stood up to this bomb is a matter for conjecture. The chances are they could not, and a prolongation of the war,

which would have brought great expansion in the production of these heavy-weight bombs and of aircraft capable of carrying them, may have made obsolete the elaborate structures on which rested the efficiency of Bruges as a war maritime base.

Two officers, Majors Erskine Childers and E. N. G. Morris, who visited Belgium after the war to report on the effect of aircraft bombing, and on German defensive measures against it, were impressed with the simple dignity of the ferro-concrete shelters in the North Darse. 'The charm for us', they said, 'was partly due perhaps to the silence and solitude of the scene—the stupendous fabric of concrete stretching out echelon after echelon into a deserted basin, its vistas of graceful columns dimly recalling the submerged ruins of the temples and palaces of Luxor, or the mythical stories, immortalized by Turner's brush, of the building of Dido's Carthage. But, aside from such fancies, the building has real architectural merit. The proportions are good; the roof-cornices are ably handled, and the brickwork for the back and sides, which were meant only to be proof against flying splinters of bombs, is skilfully employed in conjunction with the concrete to produce an effect of dignity and strength. Stripped of its grim associations with one of the most formidable forms of warfare ever devised, we may hope that some useful economic purpose will be found for this, the strangest of all the strange crop of edifices which, like armed men, germinating from the dragon's teeth, were engendered in such numbers and variety by the bomb.'

Such in brief was the growth of Bruges from which, towards the end of the war, thirty destroyers and thirty-five submarines operated. Construction work of a similar kind, although less extensive, went on at Zeebrugge and Ostend. The electric power for the dockyards was supplied by the affiliated generating stations at Slyken (Ostend), at the Solway works (Zeebrugge), and at La Brugeoise works (Bruges). The three ports offered targets of purely naval interest, and of an importance which the

reader may judge, against which the whole of the energy of the Dunkirk bombing squadrons might justifiably have been concentrated.

The bombing throughout 1917 was, however, divided between naval and military objectives, with minor attacks on the German Gotha aerodromes. In the ten months during which bombing operations were made (there were no attacks in January and March 1917), 344 tons of bombs were dropped by the Dunkirk squadrons. Of this total weight 80 tons were dropped on Bruges docks and the adjacent La Brugeoise works, 30 tons on Zeebrugge, and 10 tons on Ostend. Against the railway system, mainly in the Thourout area, a military target, 88½ tons were aimed, while 114 tons were dropped on aerodromes in the coastal region, which again may be classified as targets chiefly of military importance.

That the bombing caused considerable minor damage there is no doubt—how much it is difficult to say because the Germans immediately set to work to repair or re-build the structures which received hits—and the magnitude of the defensive measures, which made great demands on material and labour, is a sufficient tribute to those who organized and executed the attacks. But no damage of definite strategical importance was inflicted, and the question arises whether the policy which directed the bombing was sound. The striking force was comparatively small. The dissipation of that force over a number of objectives of diverse military and naval interest militated against definite material results. When the German pilots bombed the aircraft depot at St. Pol, they kept up their attacks until the depot was destroyed, and although it must be admitted that luck was on their side and that the target was exceptional, they achieved their object because they persisted.

The moral effect was no doubt enhanced by the diffuse nature of the bombing by the Dunkirk squadrons, but had less been attempted, had the striking force been concentrated on one important target at a time until a definite result was achieved, the material effects must have been greater. Bruges throughout the year was a hive of industry.

Most of the naval repair and building construction work was done during the day. Continuous day-bombing, to send the workmen into their shelters and to sap their morale, and continuous night-bombing aimed at the destruction of their handiwork, might have made the base untenable, and must, at least, have slowed down the development of the port and have impaired its efficiency. It is fairly certain that the enemy would have assembled strong fighting air units to counter the threat of concentrated bombing. If this had been done one object—the drawing away of fighters from the main front—would have been achieved. The bombing could then have been diverted to a second important target, say Zeebrugge, or the Gotha aerodromes. To sum up, it may be said that the Dunkirk air command was called upon to do too much by too many people. There was all the diverse work, of purely naval interest, required by the Vice-Admiral commanding the Dover Patrol, and there were the demands in connexion with the various military offensives in Flanders. The fortifications along the Belgian coast had to be continuously reconnoitred and photographed to a depth of about four miles. Dunkirk was a port of great naval and military activities and the Dunkirk air squadrons had to be ready to repel air attacks by day or night. The shelling of Dunkirk by long-range German guns was very much the concern of the naval airmen. They were even charged with the duty of catching and destroying Zeppelins or aeroplanes which passed over Belgium to raid English cities. This diversity, while it multiplied the responsibilities of the Dunkirk air personnel, certainly made their work peculiarly interesting, but it also made a concerted policy for the employment of the Naval Air Service squadrons almost impossible. There were too many distractions and too many changes of objective. It seems a not unfair criticism to say that the duties of the naval air units at Dunkirk should have been confined to what was required to satisfy the demands of the Vice-Admiral of the Dover Patrol, that is, should have been purely of naval interest, and that all work of military interest should have been the task of military squadrons under the direct

control of the army. Such a division of duties, more or less well defined by agreement between the naval and military authorities, would have made it possible to formulate a real policy. Moreover, it would have ensured that any naval fighting or bombing squadrons, not required for purely naval work, would have been made available to the British Commander-in-Chief in France for employment, at his discretion, in accordance with the changing military situation.

It is of historical interest that flights in British aeroplanes were made over the trenches, and beyond into Belgium, by the King of the Belgians. When the King came down from his first flight, made over Nieuport and Dixmude under anti-aircraft gun-fire in a Belgian aeroplane in March 1917, he spoke of the value of such flights to staff officers and to commanding officers because of the clear and comprehensive idea to be obtained of the field of operations. King Albert made many subsequent flights in Belgian and in British aeroplanes. Twice in 1917 he took the observer's seat in a Bristol Fighter of No. 48 Squadron, Royal Flying Corps, and, during one of these flights, reconnoitred Ostend. The Queen of the Belgians caught and shared the King's interest in the air. Her Majesty accompanied King Albert in a Royal Naval Air Service Handley Page in a flight over Coudekerque in June 1917, and flew with him to Folkestone on the 5th of July 1918 *en route* for London to join King George and Queen Mary for the celebration of their silver wedding. Unlike King Albert, who flew as a soldier, Queen Elizabeth had to wait until the day of the armistice before making a flight over the area of the trenches.¹

¹ In recognition of his flights over the lines in British aeroplanes during the war, the Distinguished Flying Cross was conferred on His Majesty the King of the Belgians.

CHAPTER IV

THE BATTLE OF MESSINES

7th-14th of June 1917

[Maps facing, and p. 212]

AFTER the failure of the Nivelle spring offensive on the Aisne, it was decided, in principle, at a conference of Allied statesmen and service representatives held in Paris on the 4th and 5th of May 1917, to transfer the main Allied effort to the British front in Flanders in accordance with plans which Sir Douglas Haig had elaborated some months before.¹ The object of this offensive was to clear the enemy from the Belgian coast, particularly from his U-boat bases, and to turn the flank of the German western defence system. Sir Douglas Haig, however, could not direct his operations solely according to the strategic possibilities. The reverse on the Aisne had shaken the morale of the French armies. General Nivelle had been dismissed, and General Petain appointed Commander-in-Chief, but such operations as the French command was able to plan throughout the remainder of the year 1917 were of strictly limited scope. While the confidence of the French troops was being restored, the British in Flanders had to shoulder the burden of the western offensive, and Sir Douglas Haig had always to be mindful of the possible effect on the French armies of any slackening of the British effort. In the course of the operations, also, he was warned by high naval authorities that if the enemy was not cleared from the Belgian coast the Fleet might not be able to hold the Channel and, as a consequence, it might not be possible to continue the war in 1918.

As a preliminary to the main offensive it was judged essential to capture the group of hills forming the Messines-Wytschaete ridge, and so rob the enemy of direct observation over much of the countryside in which the preparations for the campaign would be completed. From

¹ The British Government did not, in fact, finally approve Sir Douglas Haig's plans for the main Flanders offensive until the 20th of July.

the ruins of Wytschaete in the north, 260 feet above sea level on the highest point of the ridge, Ypres and the British trenches to the east of the town could be watched, while from Messines, at the southern end, the positions on the river Douve could be enfiladed and an important area of the valley of the Lys commanded.

The British front at Ypres was held by the Second Army, whose commander, General Sir Herbert Plumer, had prepared plans for the Messines attack more than a year before.¹ Immediately after the Paris decision of May 1917 Sir Douglas Haig conferred with his army commanders, and it was decided that the capture of the Messines ridge should constitute a distinct and separate operation: the Second Army, it was agreed, should aim at the seizure of the main positions in one day.

The German defences in the Messines area were manned by troops of the 4th Corps which formed part of General Sixt von Armin's Fourth Army. The front trenches skirted the western slopes of the ridge so as to form a deep salient running west to beyond Wytschaete with a base from the river Lys, opposite Frélinghien, to a point just short of the Menin road. A second line followed an inner curve along the crest of the ridges, but, in addition to these main systems, two chord lines had been cut across the base of the salient. One, called the Oosttaverne line, running north and south, lay a little to the east of the hamlet of that name, and the other, the Warneton line, ran roughly parallel with the Oosttaverne line about a mile farther east. The British ultimate objective was the first chord position—the Oosttaverne line—the capture of which would reduce the salient and leave the whole Messines-Wytschaete ridge, and a portion equal to it of the main Ypres ridge, in British hands. To attain their objective, the British troops would have to penetrate the enemy front along about ten miles to a maximum depth of two and a half miles.

¹ That is when Sir Douglas Haig had planned, in the event of the 1916 Somme offensive proving a complete failure, to transfer troops northward to make the Messines attack in 1916. See *Military Operations, France and Belgium 1916*, vol. i, p. 32.

On the British front of assault were three of the six Corps of the Second Army; on the right was the II Anzac Corps, in the centre opposite Wytschaete the IX Corps, and on the left, to a point opposite Mount Sorrel, the X Corps. The Royal Flying Corps squadrons attached to these three Corps were No. 42 (II Anzac), No. 53 (IX), and No. 6(X); their strength for the battle was raised to twenty-one aeroplanes each.¹ A shortening of the Fourth Army front as a result of an extension of the French line, released No. 7 Squadron which moved north into the Ypres area. The three Flights (each of six B.E.2e's) of this squadron were used to reinforce Nos. 42, 6, and 21 Squadrons. The last-named squadron was attached to the VIII Corps on the northern flank of the X Corps, and it was reinforced because the narrow front held by the IX Corps, in the centre, precluded the use of additional wireless aircraft.

In the Second Army area, before the final preparations for the battle were made, the Eleventh Army Wing was made up of two fighter reconnaissance squadrons, Nos. 20 and 45, and three single-seater fighter squadrons, Nos. 1, 41, and 46. In the middle of May the Wing was reinforced by No. 10 (Naval) Squadron from Dunkirk, equipped with fifteen Sopwith Triplanes,² and, on the 1st of June, by No. 1 (Naval) Squadron, similarly equipped, withdrawn from the Third Army. In addition, No. 70 Squadron, from the Head-quarters Ninth Wing, was attached temporarily to the II Brigade for distant photographic reconnaissance. The remaining squadrons of the Ninth Wing, Nos. 19, 56, and 66 (fighters), and Nos. 27 and 55 (day bombers), together with the Special Duty

¹ For the Order of Battle, Royal Flying Corps, on the 7th of June, see Appendix III. The Corps squadrons which had been raised to twenty-four or twenty-one aeroplanes for the Arras battle had afterwards again been reduced to an establishment of eighteen aeroplanes. Although the War Office had sanctioned a general increase of Corps squadrons to twenty-four aeroplanes, sufficient aircraft were not forthcoming to make this possible.

² Owing to a shortage of pilots, the five naval squadrons attached to the Royal Flying Corps had been reduced from eighteen to fifteen aeroplanes in May 1917.

Flight,¹ moved north to the Messines area at the beginning of June.² On the immediate right of the Second Army, the First Army received an extra fighting squadron, No. 23, from the Fifth Army, and a night-bombing squadron, No. 100, from the Third Army; the latter squadron operated under the direct orders of Royal Flying Corps head-quarters.

The eighteen squadrons (excluding No. 23 Squadron) in the actual battle area had 300 aeroplanes serviceable on the opening day of the battle—the 7th of June—of which rather more than one-third were single-seater fighters. But the offensive patrols of Nos. 23 and 40 Squadrons of the First Army were extended to include the Ypres area, and these two squadrons may therefore rightly be included in the air concentration for the battle.

While these British preparations were being made, the Germans, who were well aware of what was taking place, were also strengthening their air units in Flanders. When the Arras offensive began to slacken, a general move north had begun. Between the 4th of May and the 7th of June Armin's Fourth Army along the front from the river Douve to the sea was increased from fifteen air units (ten reconnaissance and artillery Flights and five fighter Flights) to forty-four (nineteen reconnaissance, eight protection, eleven single-seater fighter, and six bomber-fighter Flights). These units represented a nominal strength of about 300 aeroplanes of which half were fighters. That is to say, the German air strength from Messines to the sea was approximately the same as the Royal Flying Corps strength available for the ten-mile front along the Messines ridge. The total British air strength along the whole front opposed to General Sixt von Armin's army was approximately 500 aeroplanes, and this number was augmented by a few French and Belgian air units

¹ The Special Duty Flight had been formed in April 1917 for night duties as ordered by General Head-quarters (Intelligence). The Flight was responsible, among other tasks, for the landing of agents in enemy territory.

² The squadrons of the Ninth Wing were kept working over the southern area until the end of May to induce the enemy to believe that the Arras-Vimy front remained the main battle area.

operating between Zillebeke and the coast. It may be assumed that the Allied aircraft outnumbered the enemy by about two to one along this stretch of front generally, and that the disproportion was a little greater in the Messines area.¹

Because the Messines ridge completely overlooked the British positions, the success of the operations would chiefly depend on the ability of the British batteries to dominate those of the enemy. During May, many heavy, siege, and field batteries were moved from the First, Third, and Fifth Armies into the Second Army Area, and when the battle opened the artillery concentration surpassed anything previously attempted.² The artillery plans, worked out in close co-operation with the staff of the Royal Flying Corps, allowed for destructive fire, beginning some weeks before the main bombardment, by groups of batteries. German gun positions, wire, and selected strong points were to be subjected to systematic, concentrated fire. As new British batteries came into the area they were to take up their allotted tasks in accordance with the prearranged programmes, but to screen from the enemy the increasing strength of the artillery the number of batteries to be disclosed in any one Corps area on any one day was carefully limited. So that the Germans should not be made unduly alert by this type of preparation for the actual battle, artillery concentrations had, for some months past, been made periodically within the separate Corps of the Second Army.

The main tasks of the Royal Flying Corps, therefore, were to give the maximum help to the British guns and to

¹ The Germans, however, continued to reinforce the air units in Flanders for the main battle. General von Hoëppner, in *Deutschlands Krieg in der Luft* (p. 115), writing of the Flanders offensive, says: 'Because of their number and their sporting audacity, the English continued to be our most dangerous adversaries and, as before, the major part of the German air strength was concentrated against them.'

² 'On the front of attack, roughly 10,000 yards, in the inclusive period of ten days from noon 1st to noon 10th June 1917, 2,233 guns fired no less than 2,843,163 rounds, weighing 64,164 tons. This represents a gun to every 4½ yards and 6½ tons of ammunition to every yard of front attacked.' (Second Army records.)

prevent German aeroplanes from registering the battery positions. Favoured by the weather conditions, and by the effective patrolling of the fighting squadrons during the preparatory period preceding the main bombardment, the pilots and observers of the Corps squadrons methodically fulfilled their part of directing the artillery on their targets.

Systematic trench bombardment and wire-cutting were begun on the 21st of May, the fire on the rear-line, by 6-inch howitzers, being directed from the air. According to the original plan, the main bombardment was to open five days before the infantry attack, but at a conference on the 30th of May this plan, largely as a result of what was learned from captured German documents, was modified. These documents revealed that the enemy would rely, for defence, mainly on prearranged schemes of artillery fire—a fact which enhanced the importance of counter-battery work. It was therefore decided that the bombardment should be put forward two days, and that the two days before the battle should be chiefly devoted to the destruction of the German artillery. To induce the enemy to disclose the positions of his barrage batteries, it was arranged that a full-dress rehearsal of the artillery bombardment, as it would be at zero hour, with a smoke demonstration along the front of attack, should take place on the 3rd of June. The hour for this rehearsal was to be fixed on the advice of the Royal Flying Corps because it was essential to choose conditions favourable for the placing of the maximum strength in the air to discover the enemy guns.

The scope of the air offensive, by which the freedom of movement of the Corps aeroplanes was to be ensured, was more limited, and at the same time more concentrated, than that of the air offensives waged during the Somme and the Arras battles. The Messines air offensive aimed chiefly at the domination of the immediate battle area, and the enemy balloon line, approximately 10,000 yards distant from the British front line trenches, was to mark the main offensive patrol area for the fighters of the Army Wing squadrons. The effective patrol of this line would give the British artillery aeroplanes ample depth in which

to work, was calculated to keep the enemy air observers at such a distance as to make the accurate ranging of the German guns difficult or impossible, and would help to keep down the enemy balloons. The orders were that no enemy aeroplane was to be allowed to cross the German balloon line between Pérenchies and Langemarck, a distance of about seventeen miles. This stretch of barrage-line was divided into two beats, *northern* and *southern*, and each beat was patrolled from dawn to dusk, during the seven days' preliminary bombardment, by formations of fighters from 15,000 feet upwards. In addition, the central section of the barrage-line was strengthened by a patrol of six to eight fighters, at 12,000 feet or under, to ensure two layers of fighting aircraft over the more important sector of the battle front.¹

No series of barrage or offensive patrols, however, could be expected to prevent determined German two-seater pilots from getting through, from time to time, to work with the German artillery or to bomb the British lines of communication. To deal with enemy co-operating aeroplanes, the wireless interception organization, in all armies, had been recently expanded. It will be recalled² that a scheme to make use of the army wireless stations—known as 'Compass' stations—for the rapid location of enemy aircraft working over the lines, had been adopted in October 1916. The compass stations took bearings on a German aeroplane making use of wireless, and when they had, by intersection, determined its position, passed on the information to the Royal Flying Corps and to forward ground stations. The ground stations thereupon displayed code strip signals to notify patrolling British fighting pilots of the areas in which German aeroplanes had been reported: only in exceptional circumstances would fighting aeroplanes be sent out specially. At the time the scheme was put into force the expectation was that fighters would, in the near future, be fitted with wireless receiving sets, and that when this was done the information obtained by the

¹ On the day of the battle (7th of June), to protect the low-flying contact-patrol aeroplanes, some of the lower fighting patrols were brought down to 5,000 feet.

² Vol. iii, pp. 319-20.

compass stations would be transmitted to the fighting pilots in the air direct. This expectation, however, was not realized. The main reason was that, to ensure reception in the aircraft, transmitting stations of comparatively high power were required and these could only be worked at the cost of considerable interference with all other wireless communication in the front line area.

In spite of this disappointment, the wireless interception scheme had given good results and, in May 1917, it had been decided to decentralize the work from the Army compass stations and to establish new stations to be concerned exclusively with hostile aircraft. Under the new scheme, two *Aeroplane Compass Stations* and one *Aeroplane Intercepting Station* were allotted to each Army. The compass stations were placed to give good intersections on enemy aircraft, and were in direct communication with the Army Wing head-quarters or a selected fighting squadron, with the head-quarters of the Anti-Aircraft Area Commander, with the ground signal stations, and with the head-quarters of Corps Heavy Artillery. The intercepting station, which was mainly concerned to gather detailed information about the 'shoot', was placed with one of the compass stations, and the two together formed what was known as the *Control Post* of the Army, where information was centralized and the enemy aircraft activity throughout the day continuously plotted. The Royal Flying Corps was kept informed not so much of every German aeroplane working as of the general trend, both as to area and intensity, of the enemy air activity. Patrolling aircraft could be directed accordingly, and the British artillery aeroplanes could be concentrated on those areas where the German batteries were shown to be most active. The anti-aircraft personnel were responsible, on receipt of a warning from the compass station, for ascertaining the height of the enemy aeroplane, and for passing on this information to the forward ground stations (which laid out additional code ground strips), and, usually, to the Royal Flying Corps unit concerned. The fact that the compass stations were in direct touch with the artillery enabled counter-artillery action to be taken if the German

aeroplane activity indicated an impending bombardment of any particular area.

The new organization, under the guidance of the intelligence officer attached to each Army head-quarters for aeroplane wireless duties, also contributed much useful miscellaneous information about the enemy's intentions. The habits of the various German air observers and the ranging activities of the enemy batteries were studied. A 'black-list' was drawn up of all wireless calls which experience showed to presage important activity, and special attention was directed to a hostile aeroplane immediately a 'black-list' call was intercepted by the compass station. From the information collated by the intelligence officer a general picture of the enemy's aeroplane and artillery activity, and of his ground wireless organization, emerged. An increase or decrease in the work attempted, and in the number of ground receiving stations, was at once clear and often gave an early indication of the enemy's intention to reinforce or weaken a particular sector of front.

It is of interest that the Germans had a similar organization for intercepting and recording British aeroplane wireless calls. Documents captured in June 1917 revealed that the scheme had been in operation since July of the previous year, and showed that the enemy made use of it to give specific warnings whenever the aeroplane calls indicated definite targets. An example of the kind was recounted in an enemy newspaper by a member of a German battery working on the Western front. He told how, on more than one occasion, his battery had been informed, through the German Central Wireless Warning Station, that British aircraft had discovered the battery position and were about to direct the British guns on it. These early warnings, which excited the admiration of the German gunner, gave the gun detachments ample time to seek cover.

Such, in outline, was the wireless interception organization that came into general effect at the time of the battle of Messines. Under the specific arrangements on the Second Army front, preparatory to the battle, the central compass station, or 'Control Post', passed all information about enemy wireless aircraft, attempting to work in the

area of the Messines ridge, by direct telephone to the Eleventh Army Wing head-quarters which retained one fighter squadron, each day, to deal with aircraft so notified.

The general air offensive arrangements for the Messines battle may be thus summarized. There was a so-called air-barrage line covering the main battle area, and a special arrangement whereby enemy aircraft which eluded the barrage patrols could be quickly attacked. In addition, distant offensive patrols made up of one or two Flights (six to twelve aeroplanes) were sent out, about once a day, as far east as the line Lille-Menin-Roulers. Wider offensive patrols were made by the squadrons of the Ninth Wing in the area Houthulst Forest-Roulers-Menin-Quesnoy. A reference to the map will show that these various patrol areas spread out fan-wise from the Messines ridge, with the greatest concentration immediately east of the ridge.¹

The main bombardment opened as arranged on the 31st of May, and, except for a thunderstorm on the evening of the 6th of June, was made under favourable weather conditions so that the Royal Flying Corps squadrons and kite balloon sections were enabled to fulfil their detailed programmes. Two Flights from each of the three Corps squadrons in the battle area were used for observation of counter-battery fire, while the third Flight—called the ‘Bombardment Flight’—worked with specially organized artillery ‘Bombardment Groups’ for the destruction of wire, trench positions, &c.² The ‘Bombardment Flights’, on the opening day of the infantry attack, became Contact-patrol Flights. Systematic photography, to show the effect of the British fire, was a duty of all Flights in

¹ It should be noted that the air-barrage line was well over the enemy side of the lines, and formed a part only of the general air offensive patrol scheme.

² The Royal Flying Corps wireless stations with the Second Army artillery were increased from 100 at the end of April to 280 on the 7th of June. Their efficiency was ensured by an elaborate system of inspection and supervision. By strict attention to the details of wireless co-operation it was found possible to provide one wireless aeroplane for every 400 yards of front without undue risk of jamming. This compares with one for every 1,000 yards of front at the battle of Arras.

their respective areas, and an increase in the strength of the squadron photographic sections, combined with continuous day and night work on developing and printing, enabled the squadrons to keep their respective Corps supplied with timely copies of all important photographs.¹

While the main bombardment was in progress, the Corps aeroplanes enjoyed almost complete freedom of movement. On the 2nd of June two Corps aircraft were attacked, but it was not until the 7th that an artillery aeroplane was shot down by enemy aircraft.² In the week ending the 7th of June, aircraft with the Second Army observed for destructive fire on 231 German batteries, observed for 225 trench bombardments, and sent down 716 zone calls for fire on important miscellaneous targets.³ The enemy also made a determined effort, especially between Ypres and Wytschaete, that is to say, on the northern flank of the front to be attacked, to register his guns with the help of aircraft observation. The calls intercepted by the compass stations in the first week in June indicated an appreciable increase in the number of German wireless receiving ground stations on this flank. The enemy activity, on the Second Army front, was most marked on the 4th and 5th of June, and, during these two days, seventy-four British batteries were engaged, through the agency of German aircraft, with the result that twenty-seven guns were damaged and three battery ammunition dumps were exploded. Throughout the whole week ending the 7th of June, wireless signals intercepted by the compass stations showed that sixty-two German aircraft directed the fire of batteries opposite the Second Army front. On forty-seven occasions the Royal Flying Corps was informed, and the fighter squadrons,

¹ Photography to a depth of 5,000 yards behind the German front line was the duty of the Corps squadrons: beyond that area it was the duty of the army squadrons. The first prints from negatives were made in the squadrons for immediate distribution. The negatives were then sent to the Army Printing Section at Hazebrouck for additional prints to be made.

² Of thirty-three aeroplanes of the II Brigade reported missing between the 15th of May and the 9th of June, twenty-nine belonged to the Army Wing and four only to the Corps Wing.

³ For detailed figures of the artillery work by squadrons of the Second (Corps) Wing from the 15th of May to the 9th of June, see Appendix IV.

specially allocated to deal with these German aircraft, were successful in twenty-two instances in terminating the 'shoot'. One enemy aeroplane was destroyed and seven were forced down damaged. Apart from these special attacks in response to compass calls, many two-seaters were engaged by patrolling formations.¹ The enemy attempted, with a measure of success, to counter the attacks on his artillery aeroplanes by providing them with a fighting escort, as many as seven escorting single-seaters being encountered.

There was much sporadic air fighting, in the bombardment period, along the line of the offensive barrage patrol east of the Messines ridge, but the main encounters took place over the Ypres-Roulers-Menin area. These encounters, usually involving large numbers of aeroplanes on both sides, were for the most part protracted 'dog-fights' in which decisive combats were few. On the morning of the 4th of June a patrol of ten Sopwith triplanes of No. 1 (Naval) Squadron met a German formation of fifteen fighters over Moorslede. In the engagement which followed six Flying Corps aeroplanes joined. One of these—an S.E.5—was shot down, and two of the enemy aeroplanes were also destroyed. The fighting lasted twenty minutes, and as the pilots on both sides early lost formation, it was of a confused kind. On the following day—the 5th—enemy fighters had a successful encounter with eight Sopwith two-seaters of No. 45 Squadron on their way to make a photographic reconnaissance near Menin. The two-seater Sopwiths were outclassed, at this time, by the German single-seater fighters, and the advantage was with the enemy when a formation of five Albatros Scouts attacked. Other German pilots joined in later and, although the Sopwiths fought hard and sent down one Albatros in flames, they themselves suffered severely. Two were destroyed, a third was forced to land in enemy territory, and two others, shot about, were wrecked in forced landings on the British side of the lines. The successful German formation then attacked seven Sopwith 'Pups' of

¹ In all, between the 1st and 7th of June, aircraft of the Second Army destroyed thirty-two enemy aeroplanes at a cost of eighteen aeroplanes missing.

No. 46 Squadron which were patrolling the northern section of the barrage line near Polygon Wood. In the fight which ensued some of the 'Pups' had gun trouble, as did three Spads of No. 19 Squadron which joined in: one Spad and one of the enemy fighters were shot down. In the afternoon of the 5th a formation of seven F.E.2d's of No. 20 Squadron had a running fight with about fifteen Albatros Scouts above the Ypres-Menin road. The German leader, in a red Albatros, early attacked one of the F.E.'s and mortally wounded its pilot, Lieutenant W. W. Sawden, who dived for home closely pursued by the Albatros. Another of the F.E.2d's (pilot, Lieutenant H. L. Satchell, observer, Second Lieutenant T. A. M. S. Lewis) went to the assistance of Lieutenant Sawden and engaged the red Albatros in a combat lasting fifteen minutes. The German pilot showed exceptional skill and tenacity, but, eventually, a burst of bullets fired from the F.E.2d at very close range shattered a part of the Albatros, which broke up in the air and crashed near Zandvoorde. The pilot proved to be Lieutenant Karl Schaefer, one of the foremost German fighting pilots who had, at the time of his death, thirty Allied aeroplanes to his credit.

On the following day—the 6th of June—the fighting was in favour of the British, and the Sopwith triplanes of the naval squadrons did conspicuous work. In the morning, ten triplanes of No. 1 (Naval) Squadron made many successful attacks on small groups of hostile aeroplanes. Over Roulers, where they were joined by two groups of Flying Corps fighters, they attacked a German formation, two of which were shot down: the others spun away and escaped. Later the same morning thirteen triplanes of No. 10 (Naval) Squadron were engaged with fifteen German aeroplanes on the offensive barrage line. Some of the enemy aircraft were two-seaters which appeared to be on their way to the British lines when the triplanes met and attacked them. The German formation was routed: two Albatros fighters were shot down in flames (both by Flight Sub-Lieutenant R. Collishaw), and two others and a two-seater crashed to the ground: there were no British casualties.

Strategic air reconnaissances, before the battle began, were made of the enemy's main railway communications as far east as Bruges, Ghent, Grammont, and Ath, and particular attention was paid to the lines converging on Courtrai and Menin. The more distant reconnaissances were usually made by single D.H.4 aeroplanes of No. 55 Squadron, fitted with cameras, which flew between 16,000 and 21,000 feet. The nearer, and more detailed, strategic reconnaissances were made by formations of Sopwith two-seaters (usually nine) of No. 70 Squadron, escorted by a Flight of fighters. The various reports revealed no unusual enemy rail movements, but told, from time to time, of considerable mechanical transport on the roads westwards of Menin.

The day bombing, chiefly by Nos. 27 (Martinsyde) and 55 (D.H.4) Squadrons, helped to divert enemy air activity from the impending battle front. The operations began on the 3rd of June, when six Martinsydes of No. 27 Squadron scored hits with four of their twelve 112-lb. bombs on an ammunition dump at Vyfwegen. This raid was made in conjunction with the feint attack along the Messines front.¹ Next day, the activities of the squadron were diverted to an attack on the aerodrome at St. Denis Westrem which housed two Flights of the German bombing squadron responsible for the recently inaugurated day-bombing offensive against England. Thirty-nine light-weight bombs² were dropped and one shed on the aerodrome was damaged. The formation of nine Martinsydes was escorted for part of the outward journey by six Sopwith 'Pups', but no enemy appeared. On the homeward journey, however, the Martinsydes were attacked by a formation of nine Albatros fighters and lost one of their number.

While the Martinsydes were making the journey to St.

¹ See p. 124.

² The standard light-weight bomb was now the 25-lb. Cooper, a simpler type than the 20-lb. Hales which it had superseded. Supplies of the Cooper bomb had begun to arrive in France in December 1916 and were usually issued to squadrons to meet demands for the 20-lb. bomb. Issues from the existing stocks of 20-lb. Hales bombs, however, continued to July 1917.

Denis Westrem, six D.H.4's of No. 55 Squadron were fighting their way to Ingelmunster, midway between Courtrai and Thielt, to bomb the railway sidings. Ten single-seaters dived on the de Havillands soon after they had crossed the lines, and continued to attack all the way to Ingelmunster and back again. One D.H.4 was shot down and one enemy aeroplane was destroyed: the remaining five D.H.4's persisted to their objective, but their pilots had no opportunity to watch the effect of their bombing: they successfully fought their way home. An attack by a similar formation of the same squadron on an ammunition dump at Iseghem was not opposed. Seventy-two light-weight bombs fell near the target and started several fires, but the dump escaped destruction.

In the afternoon of the 5th of June eight Martinsydes, escorted part of the way by six Sopwith 'Pups', attacked the station at Audenarde without encountering opposition, and, at the same time, two formations of D.H.4's bombed the German aerodromes at Bisseghem and Marcke, south-west of Courtrai. On these targets a total of sixty light-weight bombs were dropped from 14,000 feet, but no direct hits were reported. Once again, there were no encounters with enemy aircraft.

On the 6th of June, the day preceding the infantry assault, the bombing by No. 55 Squadron was concentrated on the German aerodrome at Reckem, south-east of Menin and directly behind the impending battle-front. Three attacks were made during which 179 bombs of 20-lb. or 25-lb. weight were dropped from heights between 12,000 and 14,000 feet: some hits were made on the aerodrome buildings. The formation in the last of the three raids met and attacked three German two-seaters on the homeward journey and shot one of them down, but there was no other fighting as a result of the raids. Nor did escorted formations of No. 27 Squadron, which bombed the railway bridge over the Escaut river at Escanaffles, south-east of Courtrai, meet with opposition. In two attacks, twenty-two 112-lb. bombs were dropped, but although part of the railway track was destroyed, the bridge was not hit.

The material effect of the day bombing was not great because the attacks were made against relatively small targets from high altitudes. The night bombers of No. 100 (F.E.2b) Squadron, however, who dropped their bombs from a few hundred feet, inflicted appreciable damage. Their objectives were railway stations and trains along the lines behind the active front. During the night of the 2nd/3rd of June, in the light of a full moon, seven F.E.'s of the squadron partly wrecked a train near Wervicq and damaged three other trains and hit rolling-stock in Menin and Warneton stations. Next night thirteen pilots damaged two trains near Quesnoy, hit rolling-stock in Courtrai station, and started a fire in the goods station at Menin that was still burning some hours later. On the night of the 4th/5th of June the stations at Wervicq, Comines and Roulers, and a train on the line between Menin and Roulers, were hit: a 230-lb. bomb which struck the last-named station failed to explode. On the 5th/6th a train north of Roulers, hit by two 112-lb. bombs, was wrecked, and bombs exploded in Roulers and Wervicq stations. Next night the operation orders for the squadron were for attacks on Courtrai, Halluin, Ingelmunster, and Comines stations, and on trains along the lines Lille-Comines, Courtrai-Comines, Roulers-Ypres, and Roulers-Menin. The night, however, was stormy, and bombing was impossible until towards dawn, when selected pilots attacked Wervicq and Comines.

The full-dress rehearsal of the artillery barrage on the Messines ridge was made in the afternoon of the 3rd of June when thirty-one Corps aeroplanes kept watch to note the positions of the German batteries. They were ill-rewarded. The enemy retaliation was feeble, and not many new emplacements were discovered. Much, however, was learned from air photographs taken to show the accuracy of the barrage: gaps in the barrage at different stages, and firing short by specific guns, were revealed. The information thus obtained, together with what was learned by artillery staff officers who were flown over the front while the bombardment was in progress, enabled many minor errors of timing to be adjusted. In a further

attempt to discover some of the new German batteries the bombardment demonstration was repeated in the afternoon of the 5th, and on this occasion there was more success, except in the Wytschaete area.

The special counter-battery effort made on the 5th and 6th of June resulted in the destruction of many known German gun pits. The entire programme of aircraft observation of the fire, however, could not be fulfilled. On the morning of the 5th an ammunition train near the aerodrome of Nos. 1, 1 (Naval), 42, and 53 Squadrons, at Bailleul, was hit by a bomb dropped from a German aircraft. For three hours exploding shells and smoke and fire made it impossible for any aeroplanes to leave the ground, and for this important period the artillery of two of the three attacking Corps was robbed of all aircraft co-operation. The work was again impeded on the 6th, when many of the British batteries were heavily fired upon. On both days the systematic bombardment of the enemy wire and trenches, out of sight of the ground stations, was continued with the help of the aeroplane and balloon observers.

The Attack

From January 1916 tunnelling companies had been busy ^{7 June} under the Messines ridge, and, on the evening of the 6th of June 1917, nineteen mines, charged with over 400 tons of ammonal, were ready for explosion. At 3.10 a.m. on the morning of the 7th the mines were exploded within twenty seconds under the German defences, and, before the roar had died down, every British gun opened fire and the infantry assault was launched.

Over the attacking divisions flew the contact-patrol aeroplanes whose observers were ready to call, by Klaxon horn or Very light, for the lighting of flares at intervals in accordance with the prearranged time-schedule for each stage of the advance.¹ Because the enemy was known to be using red flares, green ones had been issued to the British infantry for this attack, but after the sun rose on the 7th of June the green flares were robbed of their

¹ Two contact-patrol aeroplanes were maintained on each Corps front throughout the day.

7 June colour and proved difficult to locate from the air. The forward infantry, however, also carried supplies of the 'Watson' fan—a pleated disk, white on one side and of a neutral tint on the other—which, when rapidly turned, attracted the attention of the air observers. In general, the contact-patrol officers had no difficulty in plotting the progress of those troops who had previously practised similar co-operation with aeroplanes, or who had been well instructed, by lectures, on its difficulties and importance. These made doubly sure that their positions should be made clear, by waving helmets, bayonets, or map cases. But where troops had not been sufficiently practised or instructed, 'they seemed to think', says a X Corps staff appreciation of the battle, 'aeroplanes were only having an 'interesting time watching the attack, and consequently 'they made no signal'. This comment requires to be qualified. What the forward infantry feared was to disclose their positions to the enemy, and it was this fear which made them reluctant to light flares or otherwise signal to the air observers. Only by experience, or by intelligent instruction, could the infantry be made to realize how important to themselves it was that they should make their position known, that their lives might depend on the air observers' reports. It was not indifference, but lack of experience which caused some of the troops to withhold their signals. One result was that the contact-aeroplane pilots had to fly over these troops at dangerously low heights before the observers could see what was happening, and four of the aeroplanes so employed were shot down.¹

¹ A former Corps squadron commander comments: 'When troops really 'required a contact aeroplane, that is, when they were out of touch or cut 'off from their main forces, they were generally afraid of showing flares 'because they feared retaliation from the enemy artillery. The result of 'this was that, where a contact aeroplane had to be sent out for a specific 'and important duty, and was generally, as was the case on our side, flying 'against a head wind, it had to fly so low to obtain the necessary information that it was often shot down. This was lamentable, since the supply of 'trained contact pilots or observers was very limited, and it was one of the 'very serious responsibilities and difficulties of a Corps squadron commander 'to decide when to send out a contact aeroplane and what amount of risk 'was justified.'

Four copies of each report and map—on specially prepared map blocks (scale, 1: 10,000)—were made in the air and then dropped, by message bag, at divisional headquarters and at the Corps report centres. From these reports the progress of the battle is clear. The battered German front line trenches offered little resistance to the attacking battalions which pressed on to the assault of the line on the crest. By 10 a.m. the forward infantry of the II Anzac and X Corps had reached the final objective of the first phase and were consolidating their hold on the captured positions, which included Messines village. An example of the value of the air co-operation with the artillery during the preliminary bombardment was offered by the ease with which the leading waves of the 25th Division crossed the line of the Steenebeek, west of Messines. This obstacle, completely hidden from ground observation, had been heavily wired and was reckoned formidable, but systematic howitzer fire had been directed on it with such precision from the air that the infantry, on the morning of the 7th, were able to cross it with little difficulty and strictly according to time-table. In the centre, the IX Corps met with stiffer opposition and was, at 10 a.m., fighting in Wytschaete village. By noon, however, nothing remained to the enemy of the crest of the ridge except a few isolated positions. There followed a halt, during which reserve troops were deployed for the further advance to the Oosttaverne line. An air observer, who flew over this line just before noon, at a height of 400 feet, reported that it was only thinly manned by the enemy.

About 2 p.m. an observer in one of two kite balloons which had, during the previous night, been brought forward within 3,000 yards of the German front line,¹

¹ One balloon, in direct communication with the Second Army report centre, had the task of reporting tactical information, and the other was attached to a forward group of artillery to direct fire on distant targets when the line advanced. A tribute to the work of the balloons is paid in a Second Army Summary of Intelligence as follows: 'Most useful work was done by Kite balloon observers on the 7th, reporting the intensity and extent of enemy barrages, progress of our own barrages, sections of hostile artillery activity centres, and the progress and location of tanks.' Six balloons were used in the battle solely on artillery work.

7 June reported the beginning of a heavy enemy barrage along the new front of the II Anzac Corps. Almost at once news came, from another source, of German infantry advancing against the line north and south of Messines. A protective barrage was promptly ordered and, by 2.30 p.m., the German counter-attack had been crushed solely by artillery fire.

At 3.10 p.m. the reserve divisions began the second phase of the advance, and their progress, under cover of an effective barrage, was rapid. At 3.45 p.m. the village of Oosttaverne was taken and, fifteen minutes later, the Oosttaverne line was entered. By the evening, the whole final objective had been captured and consolidated except east of Messines where the situation on a part of the front of the II Anzac Corps was still obscure.

Although the air observers' reports gave a fairly complete picture of the battle, they served chiefly to check and amplify the information sent back by the infantry. The counter-battery work of the British artillery proved very accurate and the enemy guns were, on the whole, dominated. One consequence was that the lines of communication by which the forward troops sent their messages suffered only occasional interruption. Also, once the ridge had been captured, daylight signalling lamps were extensively and effectively used. In addition to the aircraft arrangements for reporting the progress of the British infantry, each Corps squadron maintained one aeroplane in the air, from an hour after the infantry attack began, to give early warning of German counter-attacks and to report movements of enemy troops. The observers had instructions to send a call for barrage fire immediately German infantry were seen leaving their trenches, and to report other suitable targets by zone call. The enemy counter-attack on the II Anzac Corps, warning of which was given by a balloon observer, was also reported by an aeroplane counter-attack patrol. A few zone calls for fire on small bodies of German infantry were sent down and answered, but so swift and methodical was the British advance that the enemy resistance was paralysed and there was little useful opportunity for this form of co-operation.

There were, however, many opportunities for low-flying ² *June* attacks on ground targets by fighting pilots. An example of what surprise and daring could achieve had been afforded by a low-flying feat of Captain W. A. Bishop of No. 60 Squadron, south of the main battle area, on the 2nd of June. This officer had been flying alone in a Nieuport Scout, in search of German aircraft, when he saw seven aeroplanes lined up on an aerodrome near Cambrai. He flew low over them and opened fire with his machine-guns. One of the German aeroplanes left the ground, but was attacked by Captain Bishop from a height of sixty feet, and, after fifteen rounds had been fired, the enemy crashed. A second aeroplane took off and was in turn attacked until it fell into a tree. By this time two others had got into the air and Captain Bishop climbed to engage them. He caught up with them at about 1,000 feet and, after emptying part of a drum of ammunition into one, had the satisfaction of seeing it fall to the ground near the aerodrome. He fired his last drum into the fourth German aeroplane and then flew home: his aeroplane had been shot about by machine-gun fire from the ground. For his exploit Captain Bishop was awarded the Victoria Cross.

It will be recalled that about three weeks before, towards the end of the Arras battle, aeroplanes had, on two separate occasions, gone 'over the top' ahead of the attacking infantry, and, with machine-gun fire and bombs, had helped to demoralize the enemy troops.¹ For the Messines battle something similar was attempted, but this time the low-flying attacks were only loosely related to the infantry operations. The pilots were to rove at their will and shoot at any troops, guns or transport which they discovered.²

¹ Vol. iii, pp. 378-9.

² In a letter to the Officer Commanding the Ninth Wing, Major-General Trenchard said: 'My advice to the pilot is, although I would leave it for him to decide, that he should cross the line at Armentières very low and then shoot at everything he can, recrossing the lines at a high altitude. This is in order to harass the enemy as much as possible and to spoil the morale of his troops . . .'

The operation orders for the Ninth Wing for the 7th of June stated: '2 Sopwith Scouts, 1 Spad, and 1 S.E.5 to leave the ground as soon as there is sufficient light and attack troops on the road, and the aerodromes at

7 June Specific attacks, however, were ordered on the German aerodromes at Bisseghem and Marcke, near Courtrai. At dawn on the 7th of June fourteen pilots crossed the lines on low-flying missions from No. 43 Squadron (from the First Army area; six Sopwith two-seaters), from No. 66 (two Sopwith 'Pups'), No. 1 (two Nieuports), No. 41 (two F.E.8's), No. 19 (one Spad) and from No. 56 (one S.E.5). They found and attacked small parties of infantry, transport, gun-teams, machine-gun emplacements, and aerodrome buildings. As an example of their work, the adventures of the S.E.5 pilot, Second Lieutenant L. M. Barlow, may be quoted. He flew first to the German aerodrome at Bisseghem, where he fired into the sheds from a height of twenty feet; a nearby train then attracted his attention, and he fired into this with his Vickers and Lewis guns, first from one side of the train and then the other. In the village of Wevelghem he found and scattered troops in the main street, after which he fired into rolling-stock in the station yard. Thence he flew to Reckem aerodrome, where he finished his ammunition by firing into the aeroplane sheds. Marcke aerodrome was attacked by the Spad pilot of No. 19 Squadron. The low-flying machine-gun attacks were continued at intervals throughout the day: two of the aeroplanes were shot down and wrecked, but two others, in which the engines were damaged by fire from the ground, made safe landings on British aerodromes.

All the time the British infantry were moving forward on the 7th of June, the artillery aeroplane observers kept watch on the German batteries. Every howitzer that could be spared from barrage work was given the task of neutralizing the fire of the enemy guns, but the air observers were able to report more active targets than the artillery could engage.¹ The bombardment of the Oosttaverne line, 'Bisseghem and Marcke. On no account will any troops be fired at west of 'the Oosttaverne line. Every opportunity must be taken to harass hostile 'reinforcements with machine-gun fire. Machines returning from patrols, 'who have seen columns of infantry more than half a mile in length, will 'report, immediately on landing, their location, time seen, and the direction 'they were moving in. This is extremely important.'

¹ Of 398 zone calls for fire on German batteries sent down from the air,

during the halt in the infantry advance, was regulated by ^{7 June} the aeroplane observers who used a special call (*O.L.*), and gave general observations of the fire, specifying portions of the line by map square. For example, the wireless signal, *O.L.O.22.a. M.A.3.*, told those batteries which were firing on the part of the Oosttaerne line, shown as cutting across square O.22a. on the map, that most of their shells were bursting fifty yards east of the line.

Although the infantry of the VIII Corps on the left flank of the attack were not engaged in the battle, the artillery of the Corps was particularly well placed to deal with German batteries which threatened the X Corps area with enfilade fire. For three days before the attack began, air observers of No. 21 Squadron (eighteen R.E.8's with six B.E.2e's of No. 7 Squadron attached) had helped the VIII Corps artillery to master the German guns on this flank of the battle area. On the morning of the attack five aeroplanes of the squadron were maintained in the air from dawn, and so effectively were the numerous zone calls of the observers answered that few of the German batteries in this area could fire for long. By the afternoon the enemy fire had fallen away so much that the number of patrolling aeroplanes was reduced from five to three. The artillery war diary of the VIII Corps records that the constant watch kept by the pilots and observers of No. 21 Squadron was chiefly responsible for the mastery of the German batteries. During seventy-five hours of flying on this day, ninety-six zone calls were sent down by the squadron and, as a result of this information and of subsequent observation of fire, seventy-two German batteries were silenced.

The day bombing on the 7th of June was concentrated against the German aerodromes. The objectives were Ramegnies Chin near Tournai, Coucou west of Menin, Bisseghem west of Courtrai, and Rumbeke south-east of Roulers, and the bombing was again done by Nos. 55

no more than 165 could be answered in time for the air observers to give general corrections. At zero hour, in the three attacking Corps, 265 howitzers, of 6-inch or more, were employed on counter-battery work as compared with 252 on general bombardment.

7 June (D.H.4) and 27 (Martinsyde) Squadrons. A total of 335 bombs of 20-lb. or 25-lb. weight were dropped by these two squadrons, but owing to clouds few direct hits on the targets were made. As a result of reconnaissance reports, made by No. 43 Squadron, which told of troop and traffic concentrations in the Quesnoy-Warneton area, five F.E.2d's of No. 25 Squadron (I Brigade) were sent out, a few minutes after the report had been made, to bomb the enemy. Thirty 25-lb. bombs were dropped on the railway north-west of Quesnoy, at a detraining point, and on roads in the neighbourhood. During the night of the 7th/8th F.E.'s of No. 100 Squadron dropped two and a half tons weight of bombs on the stations at Warneton, Menin, and Courtrai, and on trains.

The German fighting aircraft showed more activity over the battle area on the 7th than they had done for some days past and, in the morning particularly, repeatedly tried to get through to attack the Corps aeroplanes. For the most part they were frustrated by the barrage patrols, while the distant offensive patrol pilots also engaged many formations which might otherwise have penetrated to the Messines area. In this distant fighting the pilots of the Sopwith triplanes of No. 10 (Naval) Squadron showed their superiority over the enemy. Three Albatros Scouts, which eluded the barrage in the morning, attacked an R.E.8 of No. 42 Squadron over the ridge. They put the Vickers gun out of action and otherwise shot the R.E.8 about, but the observer fired into one Albatros at point blank range and sent it down in flames, and then damaged one of the others, which gave up the fight and dived away east with its companion. In the afternoon an R.E.8 of No. 6 Squadron, on photographic duty with an escort of three Sopwith two-seaters, was shot down in an attack by four Albatros fighters. An F.E.2d formation of No. 20 Squadron from the barrage patrol saw the fight and joined in; they destroyed one Albatros and scattered the remainder, but not before one F.E. had been shot down and a Sopwith badly damaged. On the whole, in spite of the increased German air activity, the Corps aeroplanes were able to fulfil their tasks with inappreciable hindrance.

As has been told the situation on the evening of the 7th of June was still obscure along part of the front of the II Anzac Corps. There was further confused fighting in this area during the night, and an urgent request was made to the Royal Flying Corps to ascertain, at the earliest possible moment, the exact position at the junction of the 3rd and 4th Australian divisions. At daylight on the 8th two aeroplanes of No. 42 Squadron were sent out. The pilots flew low over the forward positions of the Australian infantry, and in response to the observers' calls, flares were plentifully lighted, enabling the flying officers to make a clear and detailed report of the position along the whole line about which doubts had existed. Throughout the 8th, consolidation of the gains of the previous day was continued. Special air reconnaissances revealed intense road traffic in the Roulers-Menin-Comines-Warneton-Lille areas. In the evening a German counter-attack, made about 7 p.m. against the greater part of the new line, was defeated by the British artillery barrage. The bombing on the 8th, again done by Nos. 27 and 55 Squadrons, was confined to an ammunition depot near Dadizeele, and hutments in the wood known as Holle Bosch. Night bombing, on railway junctions and trains, was repeated during the 8th/9th of June by No. 100 Squadron.

With the defeat of the German counter-attack on the evening of the 8th, the main phase of the battle ended and the next few days were spent in consolidation. There were no further bombing operations by the Royal Flying Corps until the 17th of June. Nor, during the intervening period, was there much decisive air fighting, partly because of low clouds and mist on a number of days, but chiefly because of a curtailment of the Flying Corps offensive. There was an outburst of activity on the 9th, when German formations harassed the Corps squadrons, and again on the 14th and 15th, but the chief objectives of the Messines battle had been won and the strength of the Royal Flying Corps had now to be conserved for the main Flanders offensive. In a memorandum to his Brigade Commanders on the 10th of June, Major-General Trenchard had stated: 'I would ask that as far as possible you do

'your best to point out to your Armies that it is of the utmost importance that the Flying Corps should avoid wastage in both pilots and machines for some little time. My reserve at present is dangerously low, in fact, in some cases it barely exists at all, and the supply from home is not coming forward sufficiently freely to enable us to continue fighting an offensive in the air continuously. It is just as impossible for the air forces to fight a continuous offensive as it is for the infantry, and as we have no reserve squadrons it is necessary to do everything to avoid losses. . . . It is of the utmost importance, however, that the offensive spirit is maintained in the Flying Corps.'

The progress of the British infantry on the right of the battle front had made the enemy positions between the river Lys and St. Yves untenable. These were gradually evacuated and, by the evening of the 14th of June, the capture of the whole of the German front and support lines north of the Lys had been completed. On the same evening final attacks were made south and east of Messines and on both sides of the Ypres-Comines Canal, and, as a result, strong enemy points which had held out north of the Canal were taken. This action marked the clearing up of the battle and the British troops settled down to strengthen their new positions.

In the air, however, activity broke out afresh. Freiherr Manfred von Richthofen, who had been on leave in Germany since the beginning of May, returned to the front on the 14th of June and, in the following week, made his presence felt. The recrudescence of enemy aggressiveness in the air above Flanders followed the first daylight bombing raid on London. A formation of fourteen Gothas attacked the City and East End of London on the 13th of June and inflicted heavy casualties. So great was the public demand for a strengthening of the London air defences that the Government decided, pending the formation of special fighting squadrons in England, to withdraw two of the most efficient of the Royal Flying Corps fighting squadrons working under Sir Douglas Haig and to use them for the patrol of both sides of the Dover Straits. On the 21st of June, No. 56 (S.E.5) Squadron flew to

England and No. 66 (Sopwith 'Pup') Squadron to Calais. The temporary withdrawal of these two squadrons left the head-quarters Ninth Wing in France with only one fighting squadron—No. 19—whose efficiency at this time was seriously impaired by engine troubles.¹ The absence of the two squadrons was seriously felt because of the increased German air activity: the enemy pilots attacked the Royal Flying Corps balloons, registered the German guns on the British batteries, flew low over the trench positions which they attacked with machine-gun fire, and did a fair amount of day and night bombing. On the 24th of June all six balloons on the front of the Second Army were attacked and three of them were sent down in flames: later in the week two other balloons were similarly destroyed. Such air fighting as there was during this period was mostly indecisive.²

The battle of Messines—an action of limited objectives—has been described as a tactical masterpiece of its kind. In a single day's fighting the Second Army advanced two and a half miles on a ten-mile front and captured a formidable natural position which had been made—so the enemy considered—impregnable by defensive science. At small loss to the attackers there had been great gains also in prisoners, guns, trench mortars, and machine-guns. A memorandum by the X Corps staff on the *Lessons of the Battle* said: 'The success was due to a great extent to the 'excellent work of the artillery which made the work of the 'infantry exceptionally easy as there was practically no 'wire left.' This may appear an overstatement in so far as it concerns the task of the infantry, but it is true that the part played by the artillery was vital, and it is clear that

¹ The Spads of No. 19 Squadron were equipped with 150 horse-power Hispano-Suiza engines: their armament was one fixed Vickers gun. An improved type, mounting two fixed Vickers guns, and equipped with the 200 horse-power Hispano, was brought into general use in November 1917.

² No. 56 Squadron returned to France on the 5th of July. No raid on London was attempted while the squadron was in England, but on the 7th, after the squadron's departure, London was attacked again. No. 66 Squadron was withdrawn from Calais on the 6th of July. While at Calais this squadron had been under the direct orders of the Commander-in-Chief, Home Forces. See also pp. 152-5.

the work of the air artillery observers, favoured by good weather, was an outstanding contribution to the success of the battle. This aircraft and artillery co-operation had been well organized, but experience in the battle showed that the artillery had often been unable to answer calls from the air for fire on fleeting targets. A General Staff memorandum¹ stated that many more batteries must, in future actions, be made responsible for answering such calls. Periods of consolidation were of particular importance for bringing fire to bear on fleeting targets because the enemy troops were then most likely to be on the move. During this time bombardment groups would, normally, be keeping up a slow rate of fire and could, therefore, temporarily allot batteries to deal with fleeting targets, but it was emphasized that this allotment must be made beforehand as part of the battle plans. Furthermore, the fact that many important calls sent down from the air had not been answered made it clear that the orders to groups and batteries relative to their responsibilities in this connexion, both during and after the infantry assault, must be made more detailed, comprehensive, and definite. The memorandum instanced an episode on the 7th of June when an air observer's call for fire on a column of German infantry, batteries, and transport on the move, was not acted upon, owing to inadequate prearrangement. As a contrast, to show the value of efficient co-operation, an example, afforded by the destruction of a German battery, was quoted. This battery was first reported active east of the Messines ridge (by *NF* call), and was promptly engaged under the air observer's direction. Soon after fire was opened, however, the enemy battery moved, but was reported on the move by a different call (*LL*), and was again fired on by many British batteries. In spite of this fire the German guns were once more brought into action, whereupon the observer changed his call (to *MONF*) and proceeded to direct a battery of the II Anzac Corps on the enemy positions until

¹ For the information of the service student, this memorandum, under the title, *Notes on Co-operation between Aircraft and Artillery during recent operations on the Second Army Front*, was printed in June 1917 as S.S.170.

BATTLES OF YPRES, 1917.



the guns were destroyed.¹ The point of this example is that the air observer altered his wireless calls to meet different circumstances, and that the unhesitating response, at each stage, of the British artillery meant that the German battery had little chance of escape.

¹ The *NF* call reported an active German battery. The *LL* call was for all available batteries to open fire to meet a sudden attack, or to engage an important target. The *MQNF* call reported activity and warned all concerned that a particular battery would be called up subsequently to engage the target for destruction, i.e. a battery with which the air observer had prearranged liaison.

CHAPTER V

THE BATTLES OF YPRES

31st July–10th November, 1917

[Map, pp. 137 and 212]

THE concentration for the Flanders campaign proceeded independently of the preparations for the subsidiary attack at Messines. Following the conference of Allied statesmen which had been held in Paris at the beginning of May, at which it had been decided, in principle, that the main Allied offensive should be transferred to Flanders, the British and French Commanders-in-Chief and their staffs had met at Amiens on the 18th of May to discuss the plan of operations. This plan, which aimed at the ultimate capture of the Belgian coast as far as the Dutch frontier, particularly of the U-boat bases, may be broadly summarized as follows.¹ In the first instance there was to be an advance from the front, Hooge–Steenstraete, with the object of securing possession of the Passchendaele–Staden ridge and, subsequently, of the Roulers–Thourout railway, thus threatening the rear of the German defences to the north. When the Passchendaele–Staden ridge had been captured, it was intended that a landing should be made on the coast between the Yser river and Ostend, in conjunction with which an attack would be delivered on the Nieuport front.

It was agreed at the Amiens conference that the French should hand over the Nieuport sector to the British to facilitate these combined naval and military operations, and, further, that the French and Belgians should each provide a force of six divisions to take part in the offensive. It was suggested that the French and Belgian divisions should be combined under Belgian command, but, on the 1st of June, it was finally arranged that the French divisions should be grouped to form the French First Army, and that its commander, General Anthoine, should receive general orders (*directives*) from Sir Douglas Haig in

¹ The British Government, it may be repeated, did not approve Sir Douglas Haig's plan for the Flanders offensive until the 20th of July.

the same manner as a British army commander. The Belgian Army, also, although remaining an independent command, was to conduct its operations in accordance with the general British strategical plans.

The main thrust, that is, the capture of the Passchendaele–Staden ridge and the Roulers–Thourout railway, was allotted to General Sir Hubert de la Poer Gough, the Commander of the Fifth Army. The control of the coastal operations was to be the task of General Sir Henry S. Rawlinson, commanding the Fourth Army. Between these two Armies were the Belgians and the French. The latter, on the left of the Fifth Army, were to form a defensive flank for that Army; the subsequent advance of the French and Belgians would be conducted in such a way as to link the main movement on Roulers–Thourout with the coastal landing. The British Second Army, on the right of the Fifth Army, was to form a defensive flank for the initial operations.

To assist the Flanders operations the French had extended their front in the Somme area, northwards to the Omignon river on the 20th of May. At that time the Fifth Army had been on the right of the British line and, in order that Sir Hubert Gough, the army commander, and his staff, might be released for the Flanders campaign, the command of all the troops in what had been the Fifth Army area, had been handed over to the Third Army at the end of May. Sir Hubert Gough reformed the Fifth Army in the Ypres area on the 10th of June by taking over the II, VIII, and XIV Corps from the Second Army, and the line from Observatory ridge to Boesinghe. On the 4th of July the Fifth Army front was extended southwards to the Zillebeke–Zandvoorde road, giving the Army a total of seven and a half miles of line along which the main opening blow was to be struck. By the 31st of July, when the infantry attacks began, redistributions of divisions, and reinforcements, had increased the strength of the Fifth Army to four Corps in the line (II, XIX, XVIII, and XIV) and to two Corps in reserve (VIII and V).

The Fourth Army, for the operations on the coast, had

begun to move north in June, when the XV Corps (Lieutenant-General Sir J. P. du Cane) began to relieve the French in the Nieuport area. General Sir Henry Rawlinson arrived at Malo-les-Bains, which he made his head-quarters, on the 8th of July, and took over command of the line from the sea to St. Georges.

Air Concentration for the Offensive

The head-quarters of the V Brigade, Royal Flying Corps (Brigadier-General C. A. H. Longcroft), had moved north with the staff of the Fifth Army early in June and had taken over Nos. 4, 7, and 21 Squadrons from the II Brigade, and No. 9 Squadron from the IV Brigade. By the beginning of July all four of these squadrons—which made up the Fifteenth (Corps) Wing—were equipped with R.E.8 aeroplanes.¹ By this time, also, the transfers of fighting squadrons to the Army Wing (the Twenty-Second) had been completed. They were No. 23 (Spad), No. 10 Naval (Sopwith Triplane), No. 32 (D.H.5), and No. 29 (Nieuport Scout). The Wing also received No. 57 (D.H.4) day bomber squadron. Of the four balloon companies (Nos. 17, 20, 8, and 13) transferred to the V Brigade, three had been working in the area of the impending battle when it was held by the Second Army, and the balloon observers knew the ground well. The Ninth Wing, we have seen, had already moved north for the Messines battle.

The air co-operation with the Fourth Army on the coast was provided by the IV Brigade. The Third (Corps) Wing of this brigade, made temporarily into an independent mixed command, had moved north with the XV Corps in June, and was made responsible for the air co-operation and protection while the line was being taken over from the French. By the 10th of July, two days after General Rawlinson arrived at Malo-les-Bains, the Royal Flying Corps concentration for the coastal operations—including the IV Brigade and the Fourteenth (Army) Wing head-quarters—was complete. The air units included two

¹ On the 31st of July No. 4 Squadron was with the II Corps, No. 21 with the XIX, No. 7 with the XVIII, and No. 9 with the XIV.

R.E.8 squadrons, Nos. 34 and 52, of the Third Wing (Lieutenant-Colonel E. R. Ludlow-Hewitt), and four fighter squadrons, Nos. 6 Naval (Sopwith 'Camel'), 9 Naval (Sopwith Triplanes and 'Pups'), 48 (Bristol Fighter), and 54 (Sopwith 'Pups') of the Fourteenth Wing (Lieutenant-Colonel R. P. Mills). No. 9 (Naval) Squadron had been completely re-equipped with Sopwith 'Camels' by the 4th of August. The balloons were supplied by two sections of No. 9 Balloon Company.

With the French First Army, on the 31st of July, were about two hundred aeroplanes of which one-half were single-seater fighters.¹ The Belgians had about forty artillery aeroplanes.

If, therefore, we include the squadrons of the II Brigade with the Second Army, we get an Allied air concentration from the Lys, north-east of Armentières (that is, the right flank of the Second Army) to the sea, of 508 British aeroplanes (230 single-seater fighters),² 200 French (about 100 single-seater fighters) and 40 Belgian, or a total of 748 aeroplanes of which 330 were fighters. To these figures, however, must be added the Royal Naval Air Service aircraft, totalling 104, which operated from the Dunkirk area over the Belgian coast.

It is not possible to give exact figures for the German air concentration from the Lys to the sea because the German Fourth Army, which was in this area, held a front from La Bassée to the coast. The air strength with this army was doubled between the 7th of June and the 31st of July.³ By the latter date the German Fourth Army Commander had at his disposal about 600 aeroplanes of which one-third were single-seater fighters, including Richthofen's new squadron of four fighter Flights.⁴

¹ Thirty of these fighters (No. 13 Group) were withdrawn on the 7th of August and a second group (No. 11) early in September.

² For the Order of Battle, Royal Flying Corps, on the 31st of July, see Appendix V.

³ The German air concentration had been completed when the offensive opened. There was very little subsequent change in the air units with the German Fourth Army between July and November 1917.

⁴ Richthofen himself was out of action from early in July until the 16th of August. On the 6th of July an offensive patrol formation of six F.E.2d's

But opposite part of the German Fourth Army front, that is to say, between La Bassée and the Lys, was part of the British First Army and, along this stretch of front, was approximately half the strength of the I Brigade, Royal Flying Corps, or, say, some ninety aeroplanes of which twenty were single-seater fighters. The German figures do not include naval air units working on the Belgian coast.¹ The military figures, therefore, taken alone, give the Allies about 840 aeroplanes and the Germans some 600 between La Bassée and the sea. In fighting aircraft the Allies disposed of 350 as compared with 200 German, or enjoyed a numerical superiority of $3\frac{1}{2}$ to 2.

As it seemed fairly certain that the offensive would be long sustained, and as there was little immediate prospect that sufficient pilots and aeroplanes would be forthcoming from England to keep the squadrons up to strength once the battle began, it was decided at the end of June to create a special reserve by reducing the squadrons of the I and III Brigades to seventeen pilots and fifteen aeroplanes. The pilots and aeroplanes in the reserve pool were to be posted, as required, to the squadrons on the active front. To offset the reduction in the strength of the I and III Brigades, the French were asked to assume responsibility from the 5th of July, as a temporary measure, for all

of No. 20 Squadron was engaged by Richthofen and numerous enemy groups of fighters to the total of forty. Four Sopwith triplanes of No. 10 (Naval) Squadron joined the encounter. The latter, without loss to themselves, drove down four enemy fighters out of control, one of which was seen to crash. The F.E.2d's also fought magnificently, but lost two of their number and had an observer wounded in a third. The pilot and observer in one of the F.E.2d's (Captain D. C. Cunnell and Second Lieutenant A. E. Woodbridge) sent down four of the enemy out of control. The observer, Second Lieutenant Woodbridge, sent down another, an all-red Albatros, but did not claim it, because, although it spun down, he did not see it crash. This aeroplane, in fact, was piloted by Richthofen who had been hit in the head by a bullet. Temporarily blinded and paralysed, the German leader fell for some distance, but succeeded in making a landing. He was in hospital until the beginning of August, when he returned to his squadron, although there is evidence that he had not properly recovered from his wound. He was in action again on August the 16th.

¹ The best available figures give the German naval air units 49 seaplanes and 14 single-seater aeroplanes.

air protection and general reconnaissance on the British front south of Havrincourt. To this request the French agreed, and the III Brigade Commander was instructed to confine his activities, on that part of the Third Army front between Havrincourt and the Omignon river, to trench reconnaissance, photography, and the work of artillery co-operation.

Employment of Aircraft

The Allied forces, we have seen, were to operate in accordance with the general plans of British head-quarters, and Major-General Trenchard, therefore, with the authority of General Head-quarters, issued instructions, or made suggestions, which aimed at co-ordinating the employment of the British and French aircraft. On the 7th of July his initial orders were issued defining the reconnaissance, offensive patrol, and bombing areas of the various commands from the Lille-Armentières railway to the sea. These were to come into force from midnight on the 8th of July (see table, p. 144).

The various air groups mentioned in the table were to make arrangements for all necessary reconnaissance, offensive and defensive work, in the areas allotted to them, without reference to Royal Flying Corps advanced head-quarters. Armies which required additional air protection in connexion with local operations, or for any other purpose, were to apply to the Royal Flying Corps head-quarters. Armies were to make their own arrangements for the interchange of reconnaissance reports which might be of special interest to adjacent commands. The Royal Flying Corps would arrange for copies of reconnaissance reports, made by the head-quarters Ninth Wing, to be sent direct to any French, Belgian, or British Army interested. Each command was supplied by Royal Flying Corps head-quarters with a map showing targets for its bombing squadrons. These targets were not selected, but included all known enemy aerodromes, ammunition and other depots, railway and other communications, billeting centres, &c. The orders for day and night bombing by the Ninth Wing and by the Naval Air Service squadrons,

<i>Aviation Unit.</i>	<i>Reconnaissance Area.</i>	<i>Offensive Patrol Front.</i>	<i>Night-bombing Area.</i>
II Brigade R.F.C.	Perenchies (incl.)—Obigies—Deerlyck (incl.)—Ypres	Armentières—Lille Railway to Hollebeke	No night-bombing.
V Brigade R.F.C.	Oosttaverne—Comines (incl.), Courtrai (incl.), Bruges (incl.), Gapaert until midnight July 12th/13th Oosttaverne—Comines (incl.), Courtrai—Thielt—Oostcamp—Keyem, all inclusive. After midnight July 12th/13th	Oosttaverne to Bixschoote	No night-bombing.
French First Army Aviation	Boesinghe—Roulers—Thourout—Schoorbakke	Boesinghe to Schoorbakke	Boesinghe—Roulers (incl.), Lichtervelde (incl.), Dixmude.
IV Brigade R.F.C.	Keyem—Ichteghem—Bruges (excl.)—Blankenberghe—Oost—Dunkirk Bains until midnight July 12th/13th	Stuyvekenskerke to Oost—Dunkirk Bains	
R.N.A.S.	Keyem—Oostcamp (incl.)—Zeebrugge (incl.)—Oost—Dunkirk Bains after midnight July 12th/13th As required for their own purposes	North of Nieuport to 3 miles west of Dunkirk	Dixmude—Thourout (incl.), Ghent (incl.)—Retranchement (excl.)—Nieuport Bains.
9th (H.Q.) Wing R.F.C.	Areas outside the above areas	As required on the whole front	Areas outside the above areas. Also areas inside the above areas when the R.N.A.S. or French First Army Aviation are unable to carry out all the work required by their own Command and British G.H.Q.

would, it was stated, be issued by Royal Flying Corps head-quarters, but targets for day bombing by other units would be at the discretion and direction of the various Army Commanders. If any command intended to bomb a target outside their normal reconnaissance area, Royal Flying Corps advanced head-quarters was to be kept informed. The French First Army aviation was to bomb by night any targets selected by their army within the area allotted, and was to inform advanced Royal Flying Corps head-quarters, by noon each day, of the specific targets chosen for the following night. The Belgian aviation received copies of these orders, for information, and was also requested to keep Royal Flying Corps head-quarters informed of any targets bombed by Belgian pilots at night. If the French First Army issued no night-bombing instructions, the Royal Flying Corps, it was stated, would allot targets to the French aviation. Alternatively, if the French air service was unable to fulfil any orders for night bombing issued by the French First Army, the Royal Flying Corps would make other arrangements for the work to be done. These preliminary instructions gave wide discretion to various commands for bombing, but later orders, issued in connexion with the opening of the battle, show that specific targets, chiefly enemy aerodromes and railway communications, were allotted or suggested by Royal Flying Corps head-quarters in accordance with a general strategic plan.¹

The instructions of the 7th of July concluded by ordering the immediate opening of the air offensive on a limited scale on the British Fifth and Second Army fronts; this offensive, it was stated, was to be increased gradually to its full power. Later the same day, however, a special supplementary order was issued which stated that the air offensive on these fronts must be fully developed from the 8th onwards. This was judged to be necessary to curtail the amount of air and artillery co-operation which the enemy was doing, and to prevent interference by enemy aircraft with the British Corps aeroplanes. At the same time the French First Army were asked to send out their

¹ See Appendix VI.

full offensive patrol strength as soon as possible. The French air offensive actually began on the 11th, and, two days later, the IV Brigade and the Dunkirk naval air units on the coast were asked to put their full strength into the air.

On the front of the Fifth Army, the immediate object of the air offensive was to stop the enemy from patrolling the area between the German balloon line and the front-line trenches, which he had been doing for some time with increasing aggressiveness. Until the effect of the air offensive should make itself felt, an inner patrol of four fighters was to be maintained over the above area to protect the Flying Corps artillery aeroplanes and to interfere with the artillery work of the enemy. The remainder of the fighting aeroplanes of the Fifth Army were to be employed on high offensive patrols as the situation required, but each patrol sent out was, first of all, to clear the area between the front-line trenches and the German balloon line. The enemy balloons were to be attacked periodically by selected single-seater pilots until the day the battle began, when organized low attacks would be made. Fighter reconnaissance aeroplanes, in addition to their photographic and reconnaissance duties, were to be employed for bombing enemy aerodromes in co-operation with attacks, by fighting formations, on enemy aeroplanes attempting to leave the ground. Up to the opening of the battle, the Corps aeroplanes were to be used entirely for artillery work and for photography: thereafter they would be used, in addition, for contact-patrol duties and for machine-gun attacks to harass the enemy.

A modification of the wireless interception scheme was introduced into the V Brigade. A section, styled the *Aerial Activity Office*, was established at Brigade headquarters to co-ordinate information about enemy air activity. Five minutes before each fighter patrol was due to leave the ground, the squadron commander was to ask the 'Activity Office' what the hostile air service was doing.

The German Attack at Lombartzyde

While the numerous preparations were in progress, the Germans delivered a surprise attack in the coastal area.

Unusual precautions had been, and were being taken to keep secret the plans for the landing of troops between the Yser and Ostend. This was to be made by the 1st Division which was put inside a camp enclosed with barbed wire. So that the training of the men might proceed without arousing suspicion, it was given out that the division was in quarantine owing to an outbreak of infectious disease. Some of the pilots and observers of No. 52 Squadron, allotted for contact-patrol duties in connexion with the landing, were segregated for training with the 1st Division. To keep enemy aeroplanes away from the practice areas, special fighter patrols were organized and, in addition, arrangements were made to obtain early warning of hostile aircraft approaching the Dunkirk area, and to have fighting aircraft in constant readiness to go up immediately a warning was received. In spite of these precautions, the German Command knew, through its Intelligence Service, that a landing might be attempted, and also discovered the change from French to British occupation in the Nieuport sector. This was because the French insisted that the British infantry should take over the line from the French infantry before the artillery relief took place. The infantry should have been changed gradually before the projected attack, but the French contention was that the support of the British guns would be insufficient, and the artillery relief did not take place until the French infantry were clear of the defences. As a result, the enemy had ample warning, and the German XIV Reserve Corps, which had been ordered to the coast sector on the 19th of May to deal with a possible coast landing or an attempted inroad by way of Holland,¹ knew the best moment to make a counterstroke.

The line taken over from the French in the Nieuport area comprised three well-defined sectors. On the right was the St. Georges sector, almost surrounded by inundations; in the centre was the Lombartzyde sector, with its flanks protected by inundations; and on the left was the Nieuport Bains sector, divided by the Geleide Brook. It was

¹ See *Feldzugsaufzeichnungen 1914-18*, by General von Moser, pp. 278-84.

a difficult area to defend, and a still more difficult jumping off ground for an offensive. In the front line the only means of communication between one sector and the next was by single bridges across the inundated areas. The front line itself was separated from its supporting troops by the Yser and Dunkirk canals, of which the former particularly constituted a serious obstacle. The way over was by three floating-barrel pier bridges (*Richmond*, *Kew*, and *Mortlake*) at the mouth of the canal near Nieuport Bains, and by three others (*Barnes*, *Putney*, and *Vauxhall*), near Nieuport itself. There was, also, a permanent roadway over the lock gates east of Nieuport, and another bridge (*Crowder*) was added, later, between *Putney* and *Vauxhall* bridges. In the centre of the front there was a stretch of over 2,000 yards along which there was no crossing over the Yser. Apart from these basic difficulties, there were others, such as the absence of cover for guns in the polder, and the risk of machine-gun stoppages due to sand storms.

While the Allied preparations were in hand, the Germans took the initiative and launched their attack.¹ The visibility on the 7th, 8th, and 9th of July was poor, with ground mist, and clouds about 900 feet. There was, in consequence, very little flying. This was the more unfortunate because there had been various reports, of an indefinite nature, of unusual enemy activity, and air reconnaissances, favoured by reasonably good weather, should have given some warning of the German intentions. The observer in one reconnaissance aeroplane, who had been specially sent out early on the morning of the 8th to look for signs of this activity, returned with a report that movements behind the German lines were normal. Although this was probably true at the time the reconnaissance was made, it is a fact that there was exceptional activity within the German lines for some days before the attack was launched, and it is a fact also that no indications that

¹ During the night of the 6th/7th of July, enemy aeroplanes successfully bombed the main aerodrome at Bray Dunes. Twelve aeroplanes and some motor transport were damaged and nine casualties were caused to personnel. The weight of bombs dropped was 750 kg.

the attack was impending were seen by the few air observers who flew over the German lines. On the 9th of July, the most important day for observation, there was no flying at all owing to the bad weather and visibility conditions.

About 5.30 a.m. on the 10th of July a heavy bombardment opened along the whole front of the XV Corps and lasted, with a short break at midday, until 7 p.m., by which time all the bridges across the Yser had been destroyed. Between 7.15 p.m. and 7.40 p.m. the Germans attacked and, except on the extreme right, overran the front. By noon on the 11th the enemy was in possession of the eastern bank of the Yser from the coast to Nieuport. The British casualties were heavy. Of the two battalions holding the front from the coast to the Geleide Brook, only four officers and seventy men got back by swimming the Yser; in all, during the two days, 126 officers and 3,000 men were lost.

To cover his attack, the enemy made extensive use of smoke screens which greatly impeded air observation, already difficult in the conditions of low cloud. Also, German fighting aircraft made many attacks. Some new German battery positions were discovered by the air observers, but most of the guns reported active had been previously located from the air. Air observers, during the evening of the 10th and again next morning, plotted the battle-line, and from their reports a situation map, showing the front line on the 11th, was compiled.

It was clear that the enemy had made a formidable concentration of guns in the area, and No. 52 Squadron was therefore increased to four Flights by the transfer of one Flight from No. 34 Squadron, and was specifically allotted to the artillery for counter-battery work. The enemy took measures, often effective, to impede this co-operation. Smoke 'pots' were placed in a circular position round the main German batteries, and when the aeroplanes of No. 52 Squadron appeared to direct the fire of the British guns, a smoke screen was started which concealed the enemy battery positions and made it very difficult for the air observers to give useful fire corrections.

The coastal attack was to begin when the Fifth Army had progressed as far as Roulers. This condition, as shall be told, was never fulfilled. The troops in the coastal area and the co-operating naval units waited in readiness throughout the summer and into the autumn, until, in October 1917, the project was abandoned. The Royal Flying Corps and naval squadrons, in the time of waiting, were kept fully occupied in the work of co-operation with the artillery, surveying and mapping the coast, and in general bombing.¹

There were, during this period, some experiments of general interest. No. 52 Squadron, under Major A. A. Walser, and the Fourth Balloon Wing, under Lieutenant-Colonel the Hon. J. D. Boyle, developed co-operation between aeroplane and balloon observers working for the artillery, a form of co-operation which had been tried elsewhere on the front, notably in the III Brigade. The initial desire was to economize the use of trained aeroplane pilots and observers of the Corps squadrons. In the III Brigade arrangements had been made at the end of April for artillery aeroplane observers to make a special call to the balloons when, through any reason, the aeroplane was compelled to return before the 'shoot' had been completed. Any balloon section which took in this signal and was in a position to observe the target, would at once get into communication with the battery concerned and proceed with the observation of fire. The arrangement developed by No. 52 Squadron was for the balloon observers to do the preliminary ranging, whenever possible, that is to say, when the observers could see the target well enough to direct the fire of the battery until the shells were falling in close proximity. Then the aeroplane could take over control and, because the observer had direct observation from above, could give whatever final corrections were required. Another development was that, after the aeroplane observer had ranged the British battery to

¹ In November 1917 the French took over the coastal sector, but the squadrons of the Royal Flying Corps stayed on, under the general command of the French, until December, when they were withdrawn into General Head-quarters reserve.

the satisfaction of its commander, the balloon observer took over general observation for destructive fire. Apart from the fact that the help given by the balloon sections effected some saving in aeroplanes and in the time of flying officers, preliminary ranging by the balloon observers, whenever it was possible, had a notable advantage during periods of intense artillery activity. At these times shells from many batteries might be falling in the neighbourhood of the target which was being ranged, but the balloon observer, who was in communication with his chart-room and knew the moment when the round he was required to observe would burst, could usually identify the shell fired by the battery which he was ranging. As no wireless-receiving sets were as yet carried in the Corps aeroplanes, the battery could not inform the observer in an aeroplane the exact moment of firing, and it might not always be possible, therefore, for the aeroplane observer to discriminate between the various shell bursts.

Another development in the Fourth Army area on the coast, but one which was also receiving attention at the same time in the First Army, was co-operation between aircraft and the sound-ranging sections of the Royal Engineers. These sections made use of a series of electrical sound receivers spaced along the front and connected to a Central Station in the rear. A forward ground observer, from a post in front of the receivers, as soon as he heard an enemy gun fire, put the system into operation by closing the electrical circuit. At the Central Station, the sounds taken in by the receivers were recorded photographically, and the range and bearing of the enemy gun could then be computed from the information shown on the film. One weak link in this system was the forward observer whose task was to put the apparatus into action. Owing to enemy shell-fire there were many times when he became isolated and unable to communicate, and it seemed that the air observers might often prove an invaluable substitute for the forward ground observing officers. The aeroplane artillery observers, in the course of their ordinary duties, passed down, usually by *NF* call, information about active enemy batteries, giving their approximate positions. In the Fourth Army the

sound-ranging section was equipped, experimentally, with a wireless apparatus so that the aeroplane signals could be received. These signals, travelling quicker than sound, enabled the sound-ranging section to start its apparatus in time to take a record of the actual round, the flash of which had been observed and reported from the aeroplane. This form of co-operation also proved valuable to the Royal Flying Corps because it enabled a hostile battery to be located by sound when, for various reasons, the aeroplane observer found it impossible to give an accurate indication of the position. Balloon observers were also employed to signal to the sound-ranging sections when the flash of an enemy gun was seen from the basket. By the beginning of 1918 co-operation between air observers and sound-ranging sections had been adopted along the whole front. At the report centres in each army the wireless messages from the air, information from balloon observers, and all other immediate intelligence about enemy gun activity, were co-ordinated, and from this centre the sound-ranging apparatus was also set in motion as required. The Corps squadrons did not, as a result of this organization, undertake additional duties, but sent down, in the normal way, indications of active German batteries.

The Influence of Air Raids on England

It will be recalled that after the first daylight aeroplane attack on London on the 13th of June 1917, Sir Douglas Haig had been requested to send to England one of his single-seater fighter squadrons, and to send another, for interception, to Calais.¹ In the first week of July, as the attack on London had not been repeated, the two squadrons had rejoined the Head-quarters Wing in France, but, on the morning of the 7th, London was bombed again, and General Sir William Robertson, the Chief of the Imperial General Staff, thereupon telegraphed to General Head-quarters in France: 'In view of to-day's raid and prospect of its early repetition Cabinet have decided at a special meeting this afternoon that Home Defence Forces

¹ See pp. 134-5.

'must be strengthened at once by two first-class fighting squadrons and have accordingly ordered me to direct you 'to dispatch two squadrons to-morrow to England, aeroplanes by air, personnel by boat, as in previous cases. 'Exact period for which the squadrons will be needed cannot be given, but it is hoped it may be possible to reinforce 'Home Defence from other sources so as to allow one 'squadron to return in about a fortnight. Cabinet are 'further desirous of your making an air raid on Mannheim, 'but before deciding they wish you to report to what 'extent this will interfere with your operations.'

Sir Douglas Haig replied that two good fighting squadrons would be sent to England next day (July the 8th), but asked Sir William Robertson to inform the War Cabinet that the fight for air supremacy, preparatory to the forthcoming operations, had begun. The air struggle, it was anticipated, would be 'the most severe we had 'yet had'. The withdrawal of two fighting squadrons would delay a favourable decision in the air and make victory more difficult and more costly in aeroplanes and pilots. If, in addition, the raid on Mannheim had to be undertaken, the plans for the whole offensive would require to be reconsidered, and the operations, dependent as they were on the gaining of air supremacy, might have to be stopped.¹ On these representations the War Cabinet reduced their demands; one squadron only would be required from France, and the project to bomb Mannheim would be abandoned. No. 46 (Sopwith 'Pup') Squadron was, therefore, sent home on the 10th of July, and remained in England until the end of August, when it returned to France.

The loss to the Royal Flying Corps in France of one first-class fighting squadron for a vital period, was not, however, the only effect of the threat to London. Three

¹ Sir Douglas Haig had been asked, after the June attack on London, to report on the possibility of a bombing raid on Mannheim. He had stated, on the 22nd of June, that he had no aeroplanes to spare for such an operation. The diversion of aeroplanes for a bombing attack of this kind would, he said, 'entail such risk to the Army Operations that I am not justified in recommending it'.

days after No. 46 Squadron crossed to England, Major-General Trenchard was informed by War Office letter that twenty-four Sopwith 'Camels' promised to him for the re-equipment of a two-seater Sopwith squadron,¹ together with an undelivered balance of four D.H.4's for another squadron, would be diverted to Home Defence squadrons. There had been no hint of such intentions in the earlier communications from the Chief of the Imperial General Staff, and Major-General Trenchard brought the matter to the notice of Sir Douglas Haig. The Commander-in-Chief wrote to Sir William Robertson on the 14th of July: 'A serious reduction has been made at the last moment in the supply of aircraft on which I was counting for my operations. I have no information as to the authority on which such an important decision has been arrived at, and I have only learnt of it through these communications, addressed by a Directorate to a General Officer under my command, who has brought them to my notice. You will appreciate, without explanation from me, the unsatisfactory nature of such a method of procedure, and still more the seriousness of my being deprived suddenly and unexpectedly, at the present juncture, of forces on which I was counting to carry through an offensive of such great importance, the preparations for which have reached such an advanced stage that no alteration or modification can now be made without grave disadvantage.' The War Office replied that the diversion of aircraft for home defence resulted from a War Cabinet decision.² And there the matter was allowed to rest. These happenings have conspicuous importance. They make clear how immediate may be the effect, on the main

¹ Three Sopwith two-seater squadrons were due to be re-equipped with the single-seater 'Camel'; No. 70 Squadron was re-equipped according to schedule by the 31st of July; No. 45 Squadron, due to be re-equipped by the 15th of August, was not completed until the 1st of September; and No. 43 Squadron, the final re-equipment of which was scheduled for the 31st of August, had to wait until the 3rd of October before the last of its 'Camels' was delivered.

² The Royal Naval Air Service at Dunkirk was also affected, although to a lesser extent. A Flight of Sopwith 'Camels', earmarked for Dunkirk, was diverted, in the middle of June, to Eastchurch for home defence.

theatre of operations, of the threat of air attacks on important centres of industry and population. The material and moral results of the two daylight aeroplane raids on London in June and July were serious. The real military consequence was the diversion, at a critical time, of appreciable fighting air strength from France to England. Thus did the German bombing squadrons strike a shrewd blow to help their comrades on the Western front. To ensure that the military effect should be maintained, the German bombing squadrons needed only to make sufficient attacks on England to keep the threat alive; they could be mainly employed against objectives on the Western front. That is to say, they could be made to pull their full weight, whereas the defence aircraft in England, except on such occasions as the enemy chose to raid, would be inactive.

These daylight attacks on London suggest, also, a more general comment. The people had been so stirred that the Government had been forced to take energetic action to prevent a repetition of the raids. That a nation might be forced to sue for peace through an air offensive against its most important centres has been put forward as a post-war doctrine, and a study of the results of the (comparatively) slight German daylight raids in 1917 will lend support to this teaching.

The Preliminary Air Offensive

The question of withdrawing squadrons from the Western Front for home defence was opened, it will be recalled, on the 7th of July, the day on which the orders to begin the air offensive had been issued. That offensive was to start on the 8th of July, but bad weather on that day and on the two following days restricted flying, and the air offensive could not be effectively launched until the 11th. On that day there was a fair amount of fighting, particularly in the evening, when enemy fighters attacked balloons and shot three down in flames on the front of the II Brigade. A feature of the air offensive was night bombing by the F.E.'s of No. 100 Squadron directed against German aerodromes opposite

the Second and Fifth Army fronts, and against railway junctions. It was known that Richthofen's newly created 'Circus' was stationed at aerodromes near Courtrai. Richthofen's head-quarters were at Marcke, where was *Jagdstaffel 11*, and the other units of his command were at Heule (*Jagdstaffel 10*), Cuerne (4), and Bissegghem (6). The three last-named aerodromes were attacked by No. 100 Squadron during the early nights of the air offensive, but Marcke was reserved for a series of concentrated bombing attacks just before the main battle opened.

The 12th of July brought a burst of air activity greater than anything the war had yet produced. There was fighting all day along the whole front, but it was most concentrated in the area opposite the Fifth Army. What was noticeable was a change in the scale of these clashes in the air. The German formations were often formidable, and they tended to attract a series of smaller British formations until an action on a large scale was in progress. For example, in the evening there was a general engagement, lasting an hour, between a mixed formation of thirty German single-seaters, and a force of British and French fighters of similar strength. Two of the enemy aeroplanes were destroyed, but all the Allied pilots returned safely, many of them with damaged aeroplanes. This was the biggest clash of the day, but elsewhere fighting went on ceaselessly from dawn to dusk with both sides in determined mood. Nine British aeroplanes were shot down in the enemy lines, and fourteen German aircraft were reported destroyed, three of them falling in the British area.

From now on to the end of the month, air activity continued to be intense. Reconnaissances, artillery co-operation, air photography, and day and night bombing, were maintained. Gradually, the fighting aircraft wore down the resistance of the enemy and it was noticeable that the German pilots showed decreasing inclination to cross the British lines. The enemy tendency towards concentration of fighting strength in the air continued. The reports of an air battle, which took place on the evening of the 26th of July near Polygon Wood, show the enemy

forces disposed as follows: at 5,000 feet were a few two-seaters; at 8,000 feet, or under, were thirty Albatros Scouts in combat with seven D.H.5's; at 12,000–14,000 feet were ten Albatros Scouts being fought by various British formations totalling thirty single-seater fighters; and higher still, at about 17,000 feet, were ten Albatros Scouts in action with seven naval Sopwith triplanes. This gives a total of ninety-four single-seaters in combat. The fighting by the various formations, which partly intermixed, was long drawn out and none of it was decisive. While the fight was in progress four of the German two-seater aeroplanes took the opportunity to slip away over the British lines where they made a reconnaissance of the Ypres area.

In a clash with about twenty Albatros Scouts in the same area on the following evening, the 27th, the British fighters had remarkable success. A formation of eight F.E.2d's of No. 20 Squadron set out to patrol in the neighbourhood of Menin, with orders to attract and then decoy enemy fighters towards Polygon Wood, where layered formations of single-seaters, totalling fifty-nine aeroplanes, chiefly from the Ninth Wing, were to be patrolling in readiness. The F.E.2d's crossed the lines at 7.15 p.m. and proceeded without incident to Menin, where, in due course, some twenty Albatros Scouts gathered. The F.E. pilots were soon involved in a fight, but they skilfully lured the enemy north-westwards towards Polygon Wood. Within a short time a general fight was in progress, in which all the British formations in the area, some French fighters, and additional enemy single-seaters, took part. Combats were continuous for an hour, at the end of which time the enemy had been completely routed, and no German aeroplane could be seen in the sky over a wide area. The F.E.2d pilots and observers had the greatest success. This two-seater 'pusher' carried three Lewis guns, two of which were controlled by the observer and one by the pilot. In their fight on the evening of the 27th the F.E.2d's destroyed six enemy aeroplanes—two in flames, one which broke up in the air, and three which crashed. The only casualties suffered by the F.E.2d's were

a wounded pilot and observer who safely landed their damaged aeroplane. Of the other enemy aircraft in the encounter, triplanes of No. 10 (Naval) Squadron destroyed two and S.E.5's of No. 56 Squadron destroyed one. One S.E.5 and one triplane were missing after the fight, but there were no other British losses. This encounter on the 27th was of a kind calculated to exert a powerful influence on the general air position.¹

Special instructions issued to the squadrons of the V Brigade on the 27th of July stated that on the 29th and 30th there would be large concentrations of British troops in the forward areas which the enemy airmen must not be permitted to reconnoitre. The outer offensive patrols, maintained by the fighter squadrons of the Brigade, would, therefore, be drawn in closer to the lines, and there would be a special continuous patrol, on both days, by pairs of fighters flying at 2,000 feet immediately behind the Fifth Army front-line trenches. The outer offensive patrols, it was stated, would be supplied by the French Army aviation service and by Ninth Wing formations. As it happened, the weather on the 29th was stormy and the visibility poor, and few enemy aeroplanes were encountered. On the 30th the conditions were still worse and there were no air combats. The air position is summarized in the war diary of the Fifth Army at the end of July as follows: 'Enemy has shown less individual activity and does not cross our line as often as he used to do. He works now in large formations which we have successfully encountered on many occasions, and nearly all encounters have taken place on the enemy side of the lines.'

The opening of the battle, originally fixed for the 25th of July, was twice postponed. The first postponement was a direct result of effective counter-battery work, aided by air observation. This induced the enemy to withdraw many of his batteries to areas of greater security, and the opening of the offensive was first post-

¹ Sir Douglas Haig wrote to Major-General Trenchard on the 28th: 'I hope you will convey to all concerned my very hearty appreciation of the strenuous efforts which have been made to obtain this grand result, and best congratulations on the success of yesterday's flying.'

poned to the 28th of July to give time for British guns to be moved farther forward, and for the Flying Corps observers to locate the new German battery positions. But subsequent bad weather of low visibility, combined with difficulties which the French encountered in bringing up their artillery, led to a second postponement to the 31st of July.

As the day for the attack drew near the Flying Corps squadrons were instructed to watch carefully for any signs of an enemy intention to withdraw to one of the rear lines of defence. In the early morning of the 27th of July a pilot and observer of No. 9 Squadron, who were directing the fire of a siege battery, were struck by the absence of any sort of anti-aircraft fire, although the aeroplane circled over the target many times at low heights. In his report, the observer, noting this fact, referred also to the neglected state of the trenches. No attempts had been made to repair damage done by shell-fire, nor was there any indication that positions suitable for strong-points, which had escaped damage by the bombardment, were to be used for machine-gun posts. As the morning wore on, other pilots and observers of the same squadron brought in additional evidence of an apparent withdrawal. Two officers who, at noon, had flown low over rear lines of trenches opposite the XIV Corps front stated they bore all the outward signs of disuse. . . . 'Not the slightest sign of life or movement', they said, 'was detected during the whole of the reconnaissance!'

In consequence, infantry patrols were pushed forward in the afternoon. Opposition was encountered in several places, but the general result was that the northern section (XIV Corps) of the Fifth Army front secured a footing in the original German trench system on a front of about 3,000 yards. During the night, patrols were sent out along the whole front of the Fifth Army, when it was made clear that no general withdrawal had taken place.

Next day, the 28th, seventeen bridges were thrown across the Yser canal by the Guards Division, and the new positions were consolidated without undue interference from the enemy. A 'sham' attack was made in the

early morning by the XVIII Corps, and practice barrages were put down along the fronts of the other Corps of the Fifth Army. The German batteries retaliated and the Royal Flying Corps observers, co-operating in the demonstration, were able to plot the positions of many additional guns. Two observers of No. 9 Squadron alone discovered and reported thirty-five active German batteries in new positions.

The Battle Opens

31 July At dawn, 3.50 a.m., on the 31st of July the offensive was launched from the river Lys in the south to the inundated area about the St. Jansbeek in the north. The Fifth Army, in the centre, had a front of about seven and a half miles, while the Second Army on its right, and the French First Army on its left, each had a front of attack of about three miles, with the object of forming defensive flanks for the main action.

The morning was dull with clouds at 500–800 feet, at which height they lay over the battle-field throughout the day. The main attack, by the Fifth Army, was organized in three stages to objectives marked on the map by blue, black, and green lines. The first and second stages each called for an advance of about 1,000 yards, and the third stage for one of 1,000–1,500 yards. Covered by artillery and machine-gun barrages, the assaulting battalions made good progress and, within half an hour, had entered their first objective, the second line of the German forward system of trenches. After a fifty-minute interval to allow fresh troops to pass through the original leading waves, the attack was resumed against the second objective—the black line—the German second defence system. At 5.13 a.m. the barrage again crept forward and, except on the extreme right, the advancing infantry overcame the enemy resistance and entered the second line of trenches. By 10 a.m. the whole of this line had been captured, except the section on the right. Preparations were hurried forward for the advance to the green line, the third and final objective of the day. This advance began along most of the front according to time-table, and, although the

resistance was stronger, the advance was held in two places *31 July* only—at the railway point south-west of Langemarck called Vulcan Crossing, and, as before, on the right where the II Corps could make little progress. Strong German counter-attacks on the green line were made against the troops of the XIX and XVIII Corps, the attacks on the former Corps being closely supported by low-flying aircraft. The enemy succeeded in recapturing part of the line, particularly on the XVIII Corps front which, except on the left, was pushed back short of the third objective.

The subsidiary actions fought by the Second Army and by the French First Army were completely successful. The Second Army, on the right, captured Hollebeke and a line of strong-points, so that the whole front was linked up and ran continuously. On the left, the French First Army carried the whole of the German first trench system with scarcely a check, and, by the end of the day, was holding positions, in line with the left of the Fifth Army, through Bixschoote to the Yser canal south of Noordschote. In other words, the flanks of the main thrust were protected.

To sum up the results of the first day's fighting, the German first defence system had been overrun as far north as Westhoek, while north of that place the troops of the Fifth Army and of the French First Army had established themselves in and beyond the German second line. North of the village of St. Julien, the Fifth Army, up to its junction with the French, held the line of the Steenebeek, whence the Allied line gradually fell back towards the original line along the Yser canal.

As a result of the bad weather, with low clouds all day and rain in the afternoon, the extensive prearranged programme for the co-operation of the squadrons of the Royal Flying Corps could not be put into force.¹ Much of the low flying that was done was against chance targets. Fifty-eight contact patrols were made during the day to report the progress of the battle. The air observers had, once again, to complain of the failure of the infantry to

¹ For the information of the student, the operation order issued by the V Brigade for the 31st of July is given as Appendix VII.

31 July light flares when called upon by Klaxon horn to do so, and pilots had to go low enough for their observers to distinguish the uniforms of the men. As a result, of thirty aeroplanes made temporarily unserviceable on this day, most were put out of action by hits from bullets or shells. Some of the air reports, so perilously compiled, although they were dropped at the prearranged report centres, did not, apparently, reach the Army Corps staffs.

On the whole, the air observers gave a fairly complete picture of the general progress of the attack, and instances are recorded where the artillery, as a result of Flying Corps information about German machine-gun posts responsible for a temporary check in the advance, were prompted to strengthen the barrage fire and so enable the infantry to overcome the obstacles.

While the Corps squadrons were contending, as best they could, with the elements over the trench area, the pilots of the army squadrons, unable to do much in the way of offensive patrols, were roving about the German immediate back areas, looking for ground targets suitable for attack with machine-guns. Troops on the march, or concentrated in the woods and villages, horse and motor transport convoys, staff motor-cars, machine-gun emplacements, aeroplanes lined up on aerodromes, and battery positions, were fired upon from low heights.

The fighter and bomber squadrons of the head-quarters Ninth Wing had been ordered to give special attention to the German aerodromes,¹ and, in spite of the bad weather, all the specified targets were reached and bombed. Bombs of light weight were dropped by No. 27 (Martinsyde) Squadron on the aerodromes at Marcke, Heule, and Ingelmunster, and others of 230-lb. weight were aimed at the railway centres.²

¹ For the Operation Order issued to the Ninth Wing Squadrons see Appendix VIII.

² One 230-lb. bomb, dropped from a height of 150 feet, hit the railway track, but failed to explode. Protracted experiments with bombs from the same stock ultimately revealed that the tail fuses had become damp, and therefore ineffective, through exposure in the heavy rains. The 230-lb. bomb had been designed for dropping from heights above 400 feet, but the experiments showed that, fitted with a 15-second delay-action fuse, the bomb

A new development was the use of single-seater fighters *31 July* for low bombing, particularly against aerodromes, with the object of keeping the enemy fighters on the ground, at least during the early stages of the offensive. As pilots in some of the head-quarters fighting squadrons were up most of the night before the attack, fitting the improvised bombing racks to the aeroplanes, it may be assumed that the idea was adopted in a hurry. Four 25-lb. Cooper bombs were fitted to each of three aeroplanes in the four head-quarters squadrons, and when the pilots went off on their missions many who watched doubted whether any of them would return, holding the view that bombs and racks attached to aircraft not designed to carry them must seriously endanger their flying capabilities. The Spads of No. 19 Squadron could not, it was found, be made to take the bomb racks. The technical sergeant-major of the squadron produced a form of box-container to be carried inside the fuselage behind the pilot, but the Spads had no form of tail-plane adjustment and their balance was disturbed. There was, in consequence, misgiving among the pilots who were called upon to test the device in the battle.

These bomb-loaded fighters flew over the enemy back areas and the pilots attacked such targets as they saw. As an example of this individual type of air warfare, the report of Lieutenant R. A. Maybery, an S.E.5 pilot of No. 56 Squadron, may be quoted. 'Left Estree Blanche at 4.45 a.m. Crossed the lines over Ypres at 500 feet just underneath very thick clouds. Got into the smoke from the artillery barrage and found it impossible to see ahead at all. Went south-east and found myself over Wervicq at 200 feet. Dived down to about 30 feet and flew straight along the road to Gheluwe. From there I went due east to Bisseghem. I could then see Courtrai and went north-east to strike Heule, but two E.A. [enemy aircraft] scouts appeared from over Courtrai and attacked me. I manœuvred to try and throw them off, pulling down my Lewis gun and firing short bursts to try and frighten them

could be dropped from 150 feet without danger to the bombing aircraft. This fuse was taken into use. Other fuses used gave a delay action of $2\frac{1}{2}$ seconds and of .05 second.

31 July 'away, but they would not be shaken off, so I made west
'again. Both E.A. followed until I reached the lines south
'of Armentières, when they turned south-east towards
'Lille. I then turned north, striking the canal at Comines,
'and again followed the same route to Bissegghem, when I
'saw a Spad just south of me firing at something on the
'ground and flying west. It was now getting a little clearer
'and I could see Courtrai more easily though the clouds
'were still at 500 feet. From Bissegghem I went north-east
'and immediately saw Heule aerodrome. I zoomed up to
'just under 200 feet. Circling round the aerodrome, the
'only sign of activity I could see was one man lighting two
'smoke fires at the Heule end of the aerodrome. This man
'looked at me, but did not seem to take any particular
'notice. I then flew east, turned and came back along the
'line of the southernmost sheds and dropped my first
'bomb, which hit the third shed from the east and ex-
'ploded. This caused immense excitement, and I could see
'people running about all round the sheds. Turning sharp
'to the left, I flew north along the line of the easternmost
'sheds and dropped another bomb, which hit the first shed
'from the south and exploded. Turning sharp to the west,
'I flew straight at the sheds at the Heule end of the aero-
'drome and dropped my third bomb, which hit the second
'shed from the east and either went through the roof or in
'at the front, as I could see smoke coming out of the front
'and heard and felt the explosion, but could not see it.
'Turned north and again flew down the line of the eastern-
'most sheds from the north. As I came near, a machine-
'gun opened fire from the back of these sheds. I pulled the
'bomb release, but nothing happened. Flying straight on
'and still watching for the explosion, I found myself ap-
'proaching Courtrai station, so pulled the bomb release
'again. The bomb fell and exploded between a goods train
'and a big shed. Turned north again to Heule aerodrome,
'and the same machine-gun and another, which I could
'not locate, opened fire. I dived at the former, shooting
'with both guns, and the crew dispersed. Turning to try
'and locate the second gun, it suddenly stopped. I then
'flew straight across the aerodrome at the southernmost

'sheds, firing both guns into the sheds from 20 feet. 31 July
'Changed Lewis drum and flew straight across the aero-
'drome from the west, firing both guns at the sheds in
'front, and at one time actually touched the ground.
'Zoomed over the sheds and flew straight on to Cuerne
'aerodrome, again attacking the sheds with both guns,
'driving back a machine which was just being got out.
'Leaving the aerodrome, saw two horsemen, who looked like
'officers. Attacked them and their horses bolted. Turned
'west and attacked a goods train going from Courtrai to
'Menin via Bisseghem. Saw a column of infantry about
'200 strong on the road just west of Wevelghem marching
'towards Menin and attacked them with both guns. They
'scattered to both sides of the road. Changed drums.
'Turned back east and attacked infantry again. Looking
'up saw one E.A. two-seater at about 500 feet, just below
'the clouds making east. Zoomed up and got very close
'under E.A.'s tail without being observed. Pulled down
'Lewis gun and fired half a drum into E.A., which started
'going down in a steep left-handed turn. E.A. straightened
'out again, and I followed, firing Vickers gun. E.A.
'crashed just north of the railway south of the G in
'Wevelghem. Only one man got out. A small crowd
'started to collect, and I dived, firing both guns. The
'crowd either ran or lay down flat. Saw a passenger train
'coming (towards Courtrai) and attacked, but Lewis gun
'ran out of ammunition and Vickers gun stopped. Flew
'west, recrossed the line south of Messines and returned.'

While other pilots did not perhaps crowd so much variety into their flights, their experiences were similar in kind. One kept up a running duel with a staff motor-car, from which revolver-fire was directed at him, and followed the car to a house. There two men jumped from the car and dragged a third into shelter. The same pilot then attacked troops crossing a bridge, who scattered but left five men lying on the roadway. Another pilot bombed Abeelhoek aerodrome and attacked the running mechanics with his machine-guns. Transport and troops on the road were frequent targets. Of one party of infantry, about fifty strong, all except four scattered when a pilot turned

31 *July* his machine-guns on them: the four stood their ground with their officer and opened fire on the aeroplane.

Such, in brief, was the work of the Royal Flying Corps on the opening day of the battle. Not much of it was of the kind which had been carefully prepared beforehand, but it represented a determined effort, dictated by the special conditions, to give the infantry a helping hand in weather that would normally have been judged unfit for flying. In the active squadrons, three pilots and one observer were killed, two pilots with their observers were made prisoners, and four pilots and four observers were wounded. Twenty-three combats for the day are recorded as a result of which eight enemy aeroplanes were destroyed.

Reports which came in from the battle-field indicated the demoralizing effect of the low-flying attacks on the German troops, but made clear also that these attacks should not be left to the discretion of individual pilots, but must be properly organized in co-ordination with the ground operations. Unless the air attacks were made at a time and place which gave the British infantry the opportunity to follow them up quickly, much of the demoralizing effect was dissipated. There was the additional fact that the sight of their own pilots attacking the enemy greatly stimulated the advancing troops. On the representations of Major-General Trenchard, therefore, a circular letter was sent to all Armies by the Chief of the General Staff drawing attention to the need for closer co-operation between the fighting squadrons of the Royal Flying Corps and the assaulting formations of the infantry when offensive operations on a large scale were being planned. The Commander-in-Chief, it was stated, was of the opinion that the procedure could be developed in future operations with good results.¹

It will be observed that these conclusions and recom-

¹ Major-General Trenchard, in a letter on the same subject to his Brigade Commanders, quoted an extract from a captured German document as follows: 'In case of hostile attacks, the 45th Flight will support 'our counter-attacks with two or three aeroplanes. These will fly in front 'of the assaulting troops, will stimulate the offensive spirit of the men by 'flying low, and will weaken the enemy's power of resistance by dropping 'bombs and opening machine-gun fire.'

mendations have reference to the employment of low-^{31 July} flying aeroplanes against front-line troops, and the student should consider them as a stage in the evolution of low-flying attacks, and not as necessarily putting forward a sound doctrine.

It was demonstrated during the advance on the first day that there still existed, among army units, a general haziness about the work and limitations of the air arm. Most of the flying on the 31st of July was done over the enemy's back areas, out of sight of the British infantry, who might therefore be excused for thinking that the Royal Flying Corps was inactive. Low-flying German aircraft got through from time to time to the fighting line and attacked the infantry, with the result that requests poured into the various Flying Corps head-quarters calling for protection. These requests created an impression that large numbers of enemy aircraft were in action, but an examination of the reports showed that many of them ran in series and referred to the same aeroplane flying over a wide area. To answer the calls for protection as they came in would have meant a great waste of effort. A paper was prepared, for circulation by the General Staff among the army units, setting out the methods and limitations of the air service. In this it was pointed out that the aeroplane was not a weapon of defence, and that even if it was possible, with an unlimited number of aircraft, to set up a close barrage along the whole front, it would still be a comparatively easy task for determined enemy pilots to get through. The policy laid down by the Commander-in-Chief for the employment of the fighting squadrons of the Royal Flying Corps was a continual offensive, varying in scope from time to time according to the resources available, but always reaching its maximum effort when offensive operations were undertaken by the other arms. 'On July 31st', the memorandum stated, 'when weather conditions were most unfavourable . . . the Royal Flying Corps took the offensive in co-operation with the other arms. All this work was carried out well out of sight of our own infantry, and must have had a demoralizing effect on the enemy's troops apart from the actual destructive results achieved.'

'On the other hand, by employing our machines in this way to the best tactical advantage, we sacrificed to some extent the moral effect which it is recognized results from the infantry seeing our own machines in the air. It is for this reason that the Commander-in-Chief desires the commanders of all formations to study the summary of the work done and to explain to the troops under their command the results which are being achieved, even in bad weather, by the tactics pursued in the air, results which the troops cannot otherwise be expected to realize.'

The second day of the battle, the 1st of August, should have brought a renewal of the offensive with increased force, but the weather, which had been difficult enough on the first day, became appreciably worse. Rain set in on the 1st and continued for four days, but even after the rain ceased on the 5th, the conditions for many days remained stormy and unsettled, and the whole work of aircraft co-operation with the artillery was thrown out of gear.¹ A good start had been made, but the advantage could not be pressed. The general effect is well pictured in Sir Douglas Haig's dispatch: 'The low-lying, clayey soil, torn by shells and sodden with rain, turned to a succession of vast muddy pools. The valleys of the choked and overflowing streams were speedily transformed into long stretches of bog, impassable except for a few well-defined tracks, which became marks for the enemy's artillery. . . . To leave these tracks was to risk death by drowning, and in the course of subsequent fighting on several occasions both men and pack animals were lost in this way. In these conditions operations of any magnitude became impossible, and the resumption of our offensive was necessarily postponed until a period of fine weather should allow the ground to recover. As had been the case in the Arras battle, this unavoidable delay in the development of our offensive was of the greatest service to the enemy.'

¹ 'Meanwhile all our counter-battery work was also made most difficult, if not impracticable, by our being largely deprived of the use of our eyes owing to the bad weather interfering with flying and the capacity of the Air Service for observation.' *The Fifth Army*, by General Sir Hubert Gough, p. 203.

‘Valuable time was lost, the troops opposed to us were able ‘to recover from the disorganization produced by our first ‘attack, and the enemy was given the opportunity to bring ‘up reinforcements.’

The Attack on Hill 70 [Loos]

[Map, p. 212]

The Ypres operations were resumed at Langemarck on the 16th of August, but on the previous day there had been a subsidiary action in the south with the object of increasing the threat to Lens and so preventing the enemy from unduly concentrating his strength in the Ypres salient.

In September 1915, during the battle of Loos, Hill 70, east of the village, had been taken and defended, but had been given up before the end of the battle. For nearly two years since that time, Hill 70, strongly fortified, had provided the enemy with an observation post. Its capture would not only rob him of a useful piece of high ground, but would also greatly strengthen the British command over the defences of Lens. At 4.25 a.m. on the 15th of August 1917 troops of the Canadian Corps attacked on a front of 4,000 yards: they took Hill 70 and established themselves in the mining suburbs of Cité Ste. Elisabeth and Cité St. Emile. East of Loos they captured the Bois Rasé and the western half of Bois Hugo. In this attack of the 15th the Canadians took all their allotted objectives, except a short length of German trench west of Cité St. Auguste, which, however, fell next afternoon.

This well-executed minor operation at Lens was notable for the success of the carefully organized work of the Flying Corps squadrons. During the night of the 13th/14th of August No. 10 (Armstrong-Whitworth) Squadron bombed railway junctions and billets east of the Lens front, notably Carvin, Berclau, and Oignies. At Oignies a fire was started, and the pilot whose bombs caused the blaze went down to 500 feet, and finding that a number of men had gathered, dispersed them with his machine-gun. Oignies was attacked again on the 14th by day-bombers

(D.H.4's) of No. 25 Squadron who dropped twenty-eight 20-lb. bombs on the village. The same squadron, late in the evening, attacked the German aerodrome at Dorignies, north of Douai, with forty 20-lb. bombs. Another aerodrome from which aircraft worked over the Lens sector—namely, Phalempin on the Douai-Lille railway—was bombed on the 14th by Martinsydes of No. 27 Squadron (four 112-lb. and thirty-two 20-lb. bombs).

In the dark hours before zero on the 15th the bombing objectives allotted to No. 10 Squadron were head-quarters and rest billets of the German divisions which were to be attacked. Fifty-one light-weight bombs were dropped by the squadron on Annay, Courrières, Oignies, Carvin, Epinoy, and Pont-à-Vendin.

15 August In conjunction with the actual attack, comprehensive arrangements were made to keep the front clear of enemy aircraft and to deal with possible counter-attacks. No. 43 (Sopwith two-seater) Squadron was employed all day from an advanced aerodrome, in groups of three aeroplanes at a time, watching a zone from 1,500 to 2,500 yards from the original front-line, and about 7,000 yards wide. Through this zone the German troops had to pass to counter-attack, and the task of the Sopwiths was to report all indications of movement, and to attack, with machine-gun fire, bodies of enemy infantry—particularly when passing through wire and other obstacles making for congestion—to engage enemy artillery, in action or on the move, and, finally, to attack any German aeroplanes which appeared over the battle. 'These tasks', said a First Army report of the operation, 'were most effectively carried out by the pilots and observers of No. 43 Squadron, who engaged a large number of targets of all descriptions with machine-gun fire, and kept the Corps head-quarters and Corps Heavy Artillery constantly informed (by telephone from their advanced landing-ground at Petit Sains) of hostile concentrations for counter-attack. The casualties were slight in comparison with the value of the work done by the squadron. Two pilots and one observer were wounded and two machines were missing, but other machines were frequently hit . . . ' One enemy two-seater aeroplane was

destroyed in combat, and one single-seater driven down *15 August* out of control. Eighteen flights, at 1,000 feet or under, were made by pilots of this squadron and a total of 5,000 rounds of ammunition were fired. An example of the frustration of an attempted German counter-attack, through the intervention of the squadron, may be given. Sixteen hundred men were seen massing for attack soon after 10 a.m. in a corner of the Bois de Dix Huit. The Sopwith pilot flew low over the wood and fired at the enemy troops with his machine-gun, after which he flew back to his aerodrome to enable his observer to report. Three more Sopwiths were sent out at once and, at the same time, the Corps Heavy Artillery was informed. The three Sopwith pilots found and fired at the enemy concentration, which was finally dispersed by two groups of heavy artillery.

Six Nieuport single-seaters of No. 40 Squadron had been sent to an advanced landing-ground at Mazingarbe. Their orders were to go up in pursuit of low-flying German aircraft when wireless messages were received from an advanced anti-aircraft observation station which was specially set up on high ground west of Loos. The observer at the transmitting station was an anti-aircraft officer, and the messages received from him proved remarkably accurate. Thirty flights were made by pilots of No. 40 Squadron, in answer to these messages, and in the majority of instances the enemy aircraft were found at the height and in the place indicated by the anti-aircraft observer. As a result, two German aircraft were destroyed—one in flames—three were shot down out of control, and many others, some of them damaged, were driven off.

As a result of the activities of Nos. 40 and 43 Squadrons, the artillery aeroplanes were able to work unmolested throughout the day. The Corps squadron chiefly concerned was No. 16 (R.E.8) attached to the Canadian Corps which (said a First Army report) 'carried out, most 'effectually, their tasks of engaging hostile batteries and 'concentrations of enemy infantry'. In a general report covering the preliminary preparations and the attack, the G.O.C. 1st Canadian Division, referring to the work of

No. 16 Squadron, said: 'Despite the unfavourable weather conditions we were kept well supplied with absolutely up-to-date photographs of the enemy's lines. This was of extreme value, particularly to the artillery. During operations the contact-patrol work was done most successfully by this squadron. Perfect liaison was maintained and we were instantly informed of the situation.'

While the attack was in progress on the 15th No. 25 Squadron again bombed Dorignies aerodrome and La Bassée and Douvrin, while No. 27 Squadron attacked Don railway station. To counter threatened enemy air activity near Lens in the afternoon Sopwith triplanes of No. 8 (Naval) Squadron patrolled the area.

The Battle of Langemarck, 16th-18th August

16 August The weather on the 16th of August, when the second attack was launched east and north of Ypres, was less favourable than on the previous day when the Flying Corps had, without hitch, been able to play their allotted part in the successful minor operation at Lens. A misty atmosphere and cloud patches on the morning of the 16th made air observation uncertain, and, although the conditions improved later in the day, the wind spread the smoke of the battle-field over the German back areas and helped to screen enemy movements.

At 4.45 a.m. on the 16th the Fifth Army moved forward along a front extending from the north-west corner of Inverness Copse to the junction with the French south of St. Janshoek. The French First Army, on the left, had the task of clearing up the remainder of the Bixschoote peninsula. The two left divisions in the British attack captured the hamlet of Weidendreft and pushed on to Langemarck. They were checked in the outskirts for a time, but, by 8 a.m., the village had been taken. An hour later they had won their final objective, part of the German third line system half a mile farther north. The attack of the French First Army had a similar success. Overcoming the resistance of isolated fortified farms, the French cleared the whole of the peninsula and also secured the bridgehead of Drie Grachten.

In the British centre, however, the enemy resistance *16 August* was formidable. Here, especially north and north-east of St. Julien, the attacking troops came up against the strong-points, built of reinforced concrete, known as 'pill-boxes'. They were distributed in depth, and, although some were overcome as the troops advanced, many held out stubbornly and made it impossible for supports to get through to those parts of the front where the attacking troops had made progress. On the British right, also, such progress as was made could not be maintained in the face of determined German counter-attacks. At the end of a day of bitter fighting the situation south of St. Julien remained unchanged except for small gains of ground on the western edge of Glencorse Wood and north of Westhoek.

Despite the gains in the north, that is, on the left of the Fifth Army front and the right of the French First Army, the day's attack had been a serious failure. Apart from the effectiveness of the new tactical device of the 'pill-box', for which as yet we had no answer, the German counter-attacks developed without warning, so that the British infantry obtained little or no artillery help against them.

The duties of the Corps squadrons were defined as artillery co-operation, and contact and counter-attack patrols.¹ So that the pilots and observers of these co-operating squadrons should be fully aware beforehand of the plan of operations, and of the timing of the advance, the Fifth Army Commander had arranged for a general staff officer and an artillery staff officer from each Corps to visit each Corps squadron to disclose and explain all details to the flying officers.

Low clouds, mist, and smoke drifting over the battle-field on the 16th, especially in the morning, made observation difficult and the counter-attack concentrations, except in rare instances, escaped the notice of the air observers. The positions of many new German guns, however, were discovered from their flashes, and, when the infantry answered calls for the lighting of flares, the air observers had little difficulty in plotting the progress of the attack.

¹ One R.E.8 was to patrol each Corps front, from dawn to dusk, to report counter-attacks.

16 August In specific instances, when the aeroplanes were in position to follow the advancing troops, the pilot could, by flying close above them, enable his observer to report the advance irrespective of any lighting of flares. Thus the capture of the intermediate line by the two left divisions, and the subsequent check in the outskirts of Langemarck, were reported by contact-patrol observers of No. 9 Squadron;¹ No. 7 Squadron reported much of the progress—as indicated by flares—of the divisions of the centre (XVIII) Corps; and Nos. 21 and 4 Squadrons similarly told of the fortunes of the XIX and II Corps on the right. These various reports, with explanatory maps, were dropped by the observers in message-bags at the prearranged reporting-centres of the division and Corps commands. No. 4 Squadron also had some success in breaking up a counter-attack. During a contact patrol in the afternoon an observer saw four parties of German infantry approaching the front in artillery formation. The pilot dived and attacked them with machine-gun fire, and the observer called up the heavy artillery. A 9·2-inch battery made good shooting, and dropped one of its first shells in the middle of one of the German infantry groups before the men had time to scatter. Another observer of this squadron was about to send back news, by wireless, of an infantry concentration he had discovered, when a shell struck the aeroplane and shattered some of the controls together with the transmitting set. The observer scribbled a message, and his pilot succeeded in getting the aeroplane to the divisional head-quarters where the message-bag was dropped: there is no evidence to show what action was taken as a result of this message.

¹ A report, of general interest, is available of the artillery observation work of No. 9 Squadron. When the ground in the Langemarck area had been captured, the G.O.C. Royal Artillery of the XIV Corps inspected the German battery positions which had been targets for counter-battery fire with the help of No. 9 Squadron's observers. He made a detailed examination of thirty-three gun positions to check the air reports. He found that the state of four targets (12 per cent.) more than confirmed the air reports; that eighteen (55 per cent.) completely confirmed them; that for nine (27 per cent.) the air reports were approximately correct; and that for two only was the air observation bad.

Twenty-two combats in the air were reported by the pilots of the four Corps squadrons engaged in the battle. An R.E.8 of No. 7 Squadron was over Poelcappelle engaged on photography when two Albatros fighters attacked. As one of the enemy aeroplanes flattened from a dive just above the British two-seater, it was hit by a burst of machine-gun fire from the observer's gun and fell out of control: what appeared to be the wreckage of the German fighter was later seen burning on the ground. The second Albatros pilot, meanwhile, dived away. An Albatros formation of eight had no better luck when they attacked one of No. 7 Squadron's R.E.8's at a low height later in the afternoon. The observer got a burst of sixty rounds into one of the German fighters at close range and it went straight down and crashed: the remaining enemy aircraft flew off without pressing the attack. An R.E.8 of No. 21 Squadron also gave a good account of itself. It was on artillery patrol over Bellewaarde Lake when a formation of nine Albatros Scouts attacked. The observer in the R.E.8 was able, from thirty yards' range, to get a burst of fire into the nearest Albatros which stalled and fell, apparently out of control. Before a second attacking Albatros could be engaged, the R.E.8 was hit and thrown out of control by an anti-aircraft shell, but the pilot was able, eventually, to make a successful forced landing.

The detailed orders for the employment, on the 16th of August, of the army squadrons of the II and V Royal Flying Corps Brigades, of the head-quarters Ninth Wing, of the Royal Naval Air Service units at Dunkirk, and of the aviation units attached to the French First Army, provided for machine-gun and bombing attacks (by night and day) on German aerodromes, for machine-gun attacks on troops and transport, and for a series of offensive patrols. Owing to the weather conditions the orders could be executed only in part. It will be instructive to consider the orders issued for the V Brigade, which was chiefly concerned. The main feature was the attempt to co-ordinate the low-flying activities of the squadrons with the infantry advance. Two D.H.5's were allotted to each divisional front for co-operation with the forward infantry in the

16 August

16 August attack on their final objective. The pilots were to patrol at a low height short of the barrage, and were to attack any enemy strong-points which appeared to hold up the infantry advance. In addition, two patrols, each of four single-seaters, were to cover the whole Fifth Army front, at a low height on the enemy side of the final objective, for six hours after the attack began. Their main task was to help to break up, with machine-gun fire, any attempted counter-attack movements. A secondary duty was to prevent German contact-patrol aeroplanes from working. At the expiry of the six hours the patrols were to be pushed out farther east to search for and attack, with bomb and machine-gun, any troop concentrations. In particular, they were to watch the roads Langemarck–Staden–Menin–Houthem. Apart from this direct co-operation of single-seaters with the assaulting troops, aeroplanes of both the Corps and Army Wings of the brigade were to maintain a rigorous offensive against all favourable ground targets west of the line Staden–Dadizeele. East of this line the fighter squadrons of the head-quarters Ninth Wing would, it was stated, be similarly occupied. The German aerodromes allotted to the brigade by Royal Flying Corps head-quarters, as targets for low-flying machine-gun attack by single-seater fighters, were Beveren, Rumbeke, Abeele, and Ingelmunster. The operation orders of the V Brigade allowed for one aeroplane to attack each aerodrome as soon as the light permitted of accurate shooting. Thereafter, throughout the day, the German aerodromes and ‘de-bussing’ points were to be bombed, and the enemy balloons attacked as opportunity offered. Inner offensive patrols to protect the Corps artillery aeroplanes,¹ and outer patrols, in the area Langemarck–Roulers–Courtrai–Wervicq, were to be maintained all day.

The German aerodromes at Beveren and Ingelmunster were duly attacked by Spad pilots of No. 23 Squadron.

¹ One of these inner patrols was of a special kind. To counter enemy low-flying two-seaters, a so-called ‘ground patrol’ of two fighters had been instituted on the 6th of August. Their duty was to patrol the British front line at 3,000 feet or under and drive off all enemy aeroplanes which approached.

The pilot who flew to Beveren, north of Roulers, left at 4.35 a.m., and first dropped two 25-lb. bombs on his target, hitting an aerodrome building with one of them. He went on beyond the aerodrome for a distance, and when he again approached it, he found a German two-seater taking off. This he attacked and shot down from a height of 100 feet, and he gave the aeroplane another burst of fire as it lay on its nose on the landing-ground. On his homeward journey the pilot saw a German battery in action, and he flew along the line of guns at 200 feet, raking them with fire from his Vickers gun. A little later he found and attacked a kite balloon, from which the observer jumped with his parachute just before the balloon went down in flames. The pilot who flew to Ingelmunster, at about the same time, narrowly missed the hangars with his two bombs, and then attacked the aerodrome buildings with his machine-gun from fifty feet. On the homeward journey he fired into bodies of troops on the Roulers-Menin road, on an active battery, and on a moving train. The attack on Rumbeke was foiled by German two-seaters, and the pilot who set out for Abeele failed to find the aerodrome and attacked buildings in the town.

Owing to the confused state of the fighting on the ground on the 16th, especially in the centre and on the right, the low-flying aircraft of the V Brigade could only partly co-ordinate their attacks with the advance of the infantry. D.H.5 pilots of No. 32 Squadron made a few attacks on strong-points and on troops in trenches and shell-holes, but the main ground-target offensive was made by Nieuport pilots of No. 29 Squadron, who made many attacks on the fronts of the XIV and XVIII Corps. German infantry in trenches and shell-holes in the front and support lines, on the march close behind the front, and bivouacked in copses, were assailed with machine-gun fire from low heights, usually 200–600 feet. Ground targets on the roads leading to the battle were also attacked by Spad pilots of No. 19 Squadron, which had been transferred to the V Brigade from the head-quarters Ninth Wing two days before.

The D.H.4's of the day-bombing squadron, No. 57, of

16 August the V Brigade, dropped 3,600 lb. of bombs on railway junctions and sidings, notably at Ingelmunster and Courtrai, and on the aerodromes at Heule and Reckem; they also took photographs of the bombing objectives and of a part of the counter-battery area.

Two hundred and thirty hours' flying were done by the five effective squadrons of the head-quarters Ninth Wing.¹ Nos. 66 (Sopwith 'Pup'), 70 (Sopwith 'Camel'), and 56 (S.E.5) Squadrons provided offensive patrols for the battle area continuously from dawn. Owing to the difficult weather conditions not much of the air fighting was decisive, but three German aeroplanes were destroyed. Pilots of the first two squadrons also attacked, with four 25-lb. bombs each, and with machine-gun fire, German aerodromes (Bisseghem, Rumbeke, Marcke, and Château du Sart), railway trains, and sidings in which were troop trains. Bisseghem aerodrome was also twice attacked by the Martinsyde bombers of No. 27 Squadron with a total of three 230-lb. and twenty-one 25-lb. bombs; Heule aerodrome received two 230-lb., two 112-lb., and twenty 25-lb. bombs from No. 55 Squadron's D.H.4's; and both squadrons attacked the railway stations and sidings at Seclin and Courtrai. One of three heavy bombs, dropped on the former place by No. 55 Squadron, blew up part of the track.²

The night-bombing F.E.2b's of No. 100 Squadron went out in force in the dark hours preceding and following the infantry attacks. During the first night, the 15th/16th of August, bombs were dropped on Roulers station, on Lichtervelde, Wervicq, and Houthem, and on the goods station in Lille. At the last-named station, which was well lighted and full of traffic, a machine-gun attack was made after the bombs had exploded. On the night of the 16th/17th, in three separate attacks, the squadron dropped about four and a half tons of bombs on Mouveaux aero-

¹ No. 22 Squadron, transferred from the III Brigade to take the place of No. 19 Squadron on the 14th of August, took no part in the air operations on the 16th.

² Low-flying attacks by two fighter pilots of the Second Army were made on Mouveaux aerodrome.

drome, and on Menin, Courtrai, Comines, and Roulers stations.¹

On the 17th and 18th of August there was local fighting as a result of minor adjustments of the line, and this brought the action known as the battle of Langemarck to a conclusion.

Minor Operations

To the end of August low clouds and rain continued, the ground in the Ypres area was a morass, and such attacks as there were on this front were of a local nature. To keep the enemy alert, minor operations were undertaken on other fronts. Some of these, on the front of the Third Army, provided an opportunity for the direct co-operation of aircraft with the infantry. The air squadrons attached to this Army had been successful in a similar undertaking just before the Langemarck battle was fought. On the 9th of August the 12th Division had attacked opposite Boiry Notre Dame: the infantry assault had been made at 7.45 p.m., and fifteen minutes before that hour, seven aeroplanes had assembled behind the lines in readiness. Just before 'zero' hour, three of them, D.H.5's of No. 41 Squadron, crossed the barrage and dived to the attack of the German infantry. At 'zero' hour promptly, the remaining four, F.E.2b's of No. 18 Squadron, passed over the heads of the advancing infantry at 500 feet, and poured their machine-gun fire into trenches, trench-mortar positions, and machine-gun emplacements. This minor action, well co-ordinated, had been highly successful. When, therefore, the III Corps began a series of small attacks on the 19th of August, south of Vendhuille, the air tactics were repeated. The first attack was made on Gillemont Farm and high ground to the east. The day-bombing squadrons of the III Brigade concentrated their attention on the German group head-quarters at Bohain, and on billeting villages immediately behind the area of the attack. When the infantry advanced, five D.H.5's of No. 41 Squadron, nine of No. 24 Squadron, four F.E.2b's

¹ During this night, also, over nine tons of bombs were dropped by Naval Handley Pages on the Thourout railway system. See p. 96.

of No. 18 Squadron, and five S.E.5's of No. 60 Squadron, went ahead of the troops at a low height and fired a total of 9,000 rounds of ammunition into enemy troops and strong-points. On the 26th of August the infantry attack was resumed on a point called Cologne Farm Hill, and, once again, twelve D.H.5's of Nos. 24 and 41 Squadrons attacked German infantry and transport. In these various actions the progress of the British infantry was well reported by contact-patrol observers, enemy aircraft were kept at a distance at the vital time by strong patrols of fighting aircraft, and the artillery aeroplane and balloon observers co-operated by reporting active German batteries and by observing for fire on them.

The Battle of the Menin Road Ridge, 20th–25th September

At the beginning of September the weather improved and the ground began to dry. Preparations went ahead for the resumption of the Ypres offensive, but as the ground would require some time to recover from the rains of August, the new attack was not timed to begin until the 20th of September.

Meanwhile, early in September, the extension northwards of General Sir Herbert Plumer's Second Army, which involved the transfer of the II Corps from the Fifth Army, had been completed.¹ The attack was to be made by all but the northernmost (Guards) division of the Fifth Army and by the Second Army with the exception of the three southernmost divisions. It was planned to extend from the Ypres–Comines canal in the south to the Ypres–Staden railway in the north, a distance, along the line then held, of just over eight miles. The average depth of the objectives was 1,000 yards, except near the Menin road, where it was a mile.

The scheme for the employment of the air service,

¹ The II Corps was relieved by the I Anzac Corps. When the battle opened the Fifth Army, from Bixschoote to just south of the Ypres–Roulers railway, included the XIV Corps (No. 9 Squadron, Royal Flying Corps), the XVIII (No. 7), and the V (No. 21). The Second Army, on its right to south of Frélinghien, had the I Anzac Corps (No. 4 Squadron), the X Corps (No. 6), the IX Corps (No. 53) and the VIII Corps (No. 42).

apart from the normal close co-operation with the attacking Corps, aimed at the destruction of rest billets housing reserve troops behind the immediate battle area, the dislocation of railway communications in the neighbourhood of Thourout, the weakening of the German air service through day-bombing attacks on aerodromes, and, particularly, at hampering German counter-attack movements. Twenty-six squadrons of the Royal Flying Corps were directly concerned.¹ The two night-bombing squadrons, Nos. 100 and 101, had for objectives rest billets at Hooglede, Rumbeke, Ledeghem, and Menin, while the bombing of Thourout railway junction was allotted to Naval Handley Pages from Coudekerque.² These attacks were to be made during the night preceding the infantry assault. On the day of the battle the bombing was to be concentrated on the German aerodromes, by low-flying fighter formations of three or four aeroplanes at dawn, and, throughout the rest of the day, by day-bomber formations from high altitudes.³ All formations were instructed to keep a special watch for and to report counter-attack movements, but, specifically, areas were allotted to the II and V Brigades and to the Ninth Wing, and maps were supplied showing enemy assembly and debussing points, &c., in each area, and the roads most likely to be used for bringing up reserves.⁴ The II Brigade area, opposite the Second Army

¹ i.e. seven Corps squadrons (9, 7, 21; 4, 6, 53, and 42); two fighter-reconnaissance squadrons (20, II Brigade, and 22, Ninth Wing, both Bristol Fighters); twelve single-seater fighter squadrons (II Brigade, 1, 19, 45, 60, and 1 Naval; V Brigade, 23, 29, 32, 70, and 10 Naval; and Ninth Wing, 56 and 66); three day-bomber squadrons (V Brigade, 57, D.H.4; Ninth Wing, 27 Martinsyde, and 55 D.H.4); and two night-bomber F.E.2b squadrons (Ninth Wing, 100 and 101—No. 101 Squadron had arrived in France from England on the 26th of July 1917).

² See p. 97.

³ The aerodromes allotted for low-flying attacks to the II Brigade were Marcke, Bisseghem, and Heule; to the V Brigade, Rumbeke, Abeele, and Ingelmunster; to the Ninth Wing, Cuerne, Harlebeke, and Abeelhoek; and to Dunkirk Naval fighters Sparappelhoek, Snellegheem, and Varsenaere. The targets for the day-bomber squadrons were: V Brigade, Rumbeke, and Hooglede; Ninth Wing, Marcke, Bisseghem, Heule, Abeelhoek, and Abeele; I Brigade, Herseaux and Château du Sart; and Dunkirk, Sparappelhoek and Aertrycke.

⁴ These *Hostile Tactical Maps*, issued a few days before the attack,

front, extended east of the barrage line as far as the Roulers-Menin railway. This was divided into three sectors, each of which was to be patrolled, continuously, for eight hours beginning at 'zero', by pairs of fighters, each pair being relieved at two-hour intervals. The instructions to the fighter pilots were to fly at heights under 500 feet on the watch for all counter-attack movements. They were to pay particular attention to the assembly points and routes as shown on the special tactical maps, and were to make machine-gun attacks on any parties of infantry, transport, or moving batteries, discovered. On their return they were to report, by telephone to the Second Army Report Centre at Locre, all enemy movements in their patrol area. These fighter pilots had the additional duty of engaging German contact-patrol or other low-flying aeroplanes.

On the Fifth Army front, only the right of which was directly involved in the attack, No. 57 (D.H.4) Squadron was made responsible for watching, throughout the day, movements of enemy reserves along the roads indicated on the tactical maps, and was to report, chiefly by dropped messages, to the Army Report Centre. On this army front no fighter formations were sent out specially to attack ground targets, but the instructions were that each offensive patrol formation was to come down from its patrol height of 6,000-8,000 feet fifteen minutes before it was due to return, and search for and attack reinforcements, reporting all enemy movements on their return. In addition to these offensive formations a low-flying patrol of six fighters was to be maintained on the Fifth Army right, from two hours after the attack began, to deal with German contact-patrol or other low-flying aircraft, and to protect the Corps squadrons' aeroplanes. East of the areas covered by the squadrons of these two brigades, that is to say, east of the line Zarren-Oostnieuwkerke-Menin, fighters of the Ninth Wing were to rove at low heights, from four hours after 'zero', to locate and attack reinforcements. Finally, all Corps squadrons were to maintain the

were compiled from air photographs, prisoners' statements, captured documents, and from the experience gained in the August fighting in this locality.

usual counter-attack patrols on their Corps fronts. Their duty was to call for immediate artillery fire, if and when counter-attacks developed, and to warn the front-line infantry by special smoke signal. Although these various instructions could not be strictly executed, owing to adverse weather conditions, they are given in some detail to show the tactical method of employment of the air arm at this period. *20 Sept.*

On the eve of the battle rain set in and continued through the night. At dawn on the 20th it ceased, but a wet mist obscured the battle-field. The assault was launched at 5.40 a.m. under weather conditions that promised an early improvement. Good progress was made from the start, and, by nightfall, except for a few points of minor importance, all the objectives had been won. The high ground crossed by the Menin Road, so stubbornly fought for and so fiercely defended in previous attacks, passed into our possession. The enemy knew the value, for the development of future operations, of the ground which he had lost, and, during the afternoon and evening of the 20th, delivered eleven counter-attacks: many others which were attempted were broken up by artillery fire before they could be launched. Up to the 25th of September powerful counter-attacks were continued and led to bitter fighting, but they made no appreciable impression on the line.

As soon as it was light enough to see the ground on the 20th, the aeroplanes were over the lines, but not much could be accomplished until about 8 a.m. when the mist cleared. Single-seater fighters from the two armies and from the head-quarters Ninth Wing went out as ordered from 6 a.m. onwards, and flew over the German positions at a height of a hundred feet or less. Sixty-seven 25-lb. bombs were dropped, and more than 28,000 rounds of ammunition fired at ground targets during the day. The targets included troops drilling and on the march behind the battle-front, motor-cars, barges on the canals, active batteries and machine-guns, kite-balloons, &c., as well as front-line troops. Three examples of the many dozens of attacks of this kind may be quoted. One pilot of No. 1

20 Sept. (Naval) Squadron, in a Sopwith triplane, saw German infantry concentrated in a strung-out line of shell-holes towards which Second Army troops were advancing. He dived within a few feet of the ground and attacked the enemy troops, and he kept up his attack as the men rushed in panic from hole to hole. This action stimulated the British infantry who waved to the pilot and then went on and captured their objective. A Nieuport pilot of No. 29 Squadron, on the Fifth Army front, saw two machine-guns in action. He dived and attacked the gunners, who ran for cover to neighbouring shell-holes, knocking over their guns as they went. The pilot also attacked men concentrated in a line of trenches. A 'Camel' pilot of No. 70 Squadron discovered a column of horse transport on the way to the front. He swept the column with his twin machine-guns: the drivers jumped and ran, the horses, some of them hit, became unmanageable, and when the pilot had finished, the column was entirely disorganized.

When the mist cleared on the 20th of September, although the clouds still remained low, the contact-patrol and artillery observers came into close touch with the battle. From that time onwards throughout the day a stream of wireless messages came from the observers in the seven R.E.8 squadrons engaged on Corps work, telling of important enemy targets. Three hundred and ninety-four such messages were sent out by 'zone-call', and about one-third led to immediate artillery fire. Fire for destruction was directed by the aeroplane observers against thirty-two German batteries, and, for neutralization, against forty-eight others. As a result, three gun-pits were blown up, and thirteen set on fire. This artillery co-operation was supplemented by the balloons, whose observers reported the positions of one hundred and twenty-eight active German batteries, and helped to direct the fire of artillery on forty-eight targets.

The contact and counter-attack patrol observers watched the battle through most of the day. Flares were plentifully lighted when called for along the greater part of the front, and the advance was consequently well reported. Undoubtedly the most important air work of the

whole day was the warning given of German counter-attacks. It will be recalled that in the battle fought at Langemarck on the 16th of August, the Royal Flying Corps observers were prevented by the weather from discovering German counter-attack concentrations, with the result that the British infantry, when the attacks came, received little artillery support and were compelled to fall back. On the 20th of September the air observers were able to give this essential help to the infantry. Early in the day air reports revealed that two German counter-attack divisions had been put in motion from the Dadizeele line. As the divisions moved up to the battle-front, where they appeared in the afternoon, artillery fire was directed on them, and they were subjected to low-flying attacks. There were eight specific instances on the front of the Second Army of the breaking-up, by the artillery, of attempted counter-attacks, as a result of information sent down from the air. These air reports referred to concentrations near Zonnebeke at 8.30 a.m., south of Droogenbroodhoek at 9.45 a.m., at Polygon Wood at 10.20 a.m., north of Zandvoorde at 12.40 p.m., east of Zandvoorde between 2 and 2.30 p.m., against Polygon Wood at 3.40 p.m., east of Zandvoorde once more at 5 p.m., and, finally, north of Tenbrielen at 6 p.m. These facts may appear colourless in comparison with other forms of air activity, but they represent, nevertheless, a substantial contribution by the air service towards the success of the battle.¹ It may also be remarked that many of the low-flying attacks on the reinforcing divisions were delivered before the enemy troops came within range of the British artillery.

The Corps aeroplanes were little troubled in their work by enemy aircraft. On the front over which the pilots of the II Brigade flew, there were seventy-two

¹ 'It is significant that, although the enemy was well aware of our intention to attack, his counter-attacks did not develop yesterday with anything like their previous intensity. It is evident that our information as to their assembly places and the careful co-operation between the Royal Flying Corps and artillery resulted in hostile attempts being broken up at the outset.' (Second Army Intelligence Summary, September 21st, 1917.)

20 Sept. combats on the 20th, but six only of these involved Corps aircraft. On the V Brigade front there were four combats by Corps aeroplanes as compared with thirty-six by fighters of the Army Wing. Ten British aeroplanes, chiefly engaged on low-flying, failed to return, one contact-patrol aeroplane was destroyed by a shell, a pilot was killed, and nine pilots and observers were wounded. Six German aircraft were destroyed in combat and one by infantry fire. That the German airmen were kept away from the front was of direct help to the British infantry, apart from the fact that the co-operating Royal Flying Corps pilots and observers were able to give their full attention to the task of harassing the enemy batteries and troops. The compass stations of the Second Army, for instance, were able to report at the end of the day that they had failed to detect the presence of any German aeroplanes working in co-operation with the enemy artillery.¹

Owing to the early morning mist, the dawn low-flying attacks by fighting aircraft on German aerodromes could not be made, although some were attempted. When the mist cleared, clouds remained low and the day-bombers of No. 27 (Martinsyde) Squadron were sent out individually or in pairs, instead of in formation, to bomb their allotted aerodromes. Those attacked were at Bissegheem, Marcke, Abeele, and Heule.² Two pilots of the squadron also attacked Wervicq and Aelbeke.

Before dawn on the 20th the night-bombers of Nos. 100 and 101 Squadrons had attacked billets at Rumbeke, and Hooglede, and the town of Menin. Prisoners taken in the morning stated that German reserve troops would detrain at Ledeghem railhead and that considerable

¹ 'The enemy's onslaught on the 20th was successful, which proved the 'superiority of the attack over the defence. . . . The power of the attack 'lay in the artillery and in the fact that ours did not do enough damage to 'the hostile infantry as they were assembling, and above all, at the actual 'time of the assault.' (Ludendorff, *My War Memories*, p. 488.)

² No. 25 Squadron of the I Brigade dropped fifty 25-lb. bombs on the aerodrome at Château du Sart (near Lille), and forty-six 25-lb. bombs on Herseaux aerodrome. No. 5 (Naval) Squadron dropped two 65-lb., two 50-lb., and sixteen 16-lb. bombs on the aerodrome at Aertrycke, and fifteen 65-lb. and sixty-five 16-lb. bombs on that at Sparappelhoek.

ammunition had already been dumped there. Air reconnaissance reports confirmed that there was great activity at Ledeghem station and, in the afternoon, therefore, under improved weather conditions, eleven D.H.4's of No. 55 Squadron, in two formations, attacked the station from 15,000 feet with twelve 112-lb. and fifty-six 25-lb. bombs. Six bombs were seen to hit the station buildings.

For four days after the advance on the 20th the enemy made determined efforts to regain the more important sectors of the line that had been lost. These attacks were particularly fierce north-east of St. Julien, and on the front between Tower Hamlets and Polygon Wood.

During the night of the 20th/21st of September Nos. 100 and 101 Squadrons bombed Menin and other detraining centres. The two squadrons dropped thirteen 230-lb., twenty 112-lb., and forty-two light-weight bombs on Menin station, Wervicq, Ledeghem, Seclin, and Roulers, and fired a total of 4,000 rounds of ammunition at various ground targets. Seventeen of the bombs were reported to have made hits on trains in Menin station.¹

On the morning of the 21st of September, air reconnaissance reports, made between 7 a.m. and 9.15 a.m., left no doubt that considerable reinforcements were arriving at Roulers and Menin stations. No. 55 Squadron was thereupon ordered to attack the station at Roulers where most activity had been reported. The squadron dropped twenty 112-lb. bombs on the target, and many of them were seen to hit: a fire was started in one of the station sheds. In the evening of the 21st air reconnaissances reported that troops were pouring in, by rail, to Menin and were being transported thence, by motor-bus, to the front. Nos. 100 and 101 Squadrons were thereupon ordered to attack the town, and other detraining centres, as well as the roads along which the movement of troops had been reported. The pilots of the two squadrons began their attacks as soon as it was dark and kept them up throughout the night. By the light of parachute flares, dropped from the aeroplanes from time to time, it was

¹ For day and night bombing, in co-operation with the offensive, by naval squadrons from Dunkirk, see pp. 97-8.

seen that the Menin-Ypres road was crowded with troops and vehicles. The information was passed back to the British artillery which fired on the routes all night. The pilots of No. 100 Squadron dropped fourteen 230-lb. and sixty-eight 25-lb. bombs on the endless targets along the road, and then, from low heights, attacked the troops with their machine-guns. Other bombs dropped by this squadron were on Menin (nine 230-lb., two 112-lb., and thirty-three 25-lb.), on Ledeghem (five 230-lb. and twelve 25-lb.), on Wervicq (one 230-lb., one 40-lb. phosphorous bomb, and one 25-lb.), and on the village of Gheluwe. No. 101 Squadron pilots dropped their bombs on Roulers station (five 230-lb. and twelve 112-lb.) and on Menin (two 230-lb.). On the night of the 22nd/23rd of September the same two squadrons again attacked the German reinforcement centres. The targets were Wervicq town and station (seven 230-lb. and six 40-lb. phosphorous bombs), Menin town and station (six 230-lb. and thirteen 25-lb.), Gheluwe (one 230-lb., one 40-lb., and three 25-lb.), and Roulers station (five 230-lb. and eleven 112-lb. bombs). In addition, one 40-lb. phosphorous bomb and twenty-five 25-lb. bombs were dropped on transport on the Gheluvelt-Menin and Gheluvelt-Wervicq roads.

In the evening of the 23rd Captain J. T. B. McCudden, of No. 56 Squadron, had just attacked and destroyed an enemy two-seater aeroplane when he saw another S.E.5 pilot in combat with a Fokker triplane. With other members of his squadron he joined in the fight, and it soon became apparent that the German pilot had exceptional skill and courage. He fought seven opponents for some time, single-handed, but was later joined by a red-nosed Albatros fighter. Later still, formations of other Albatros fighters arrived, with a group of British Spads close behind them. For some time the fight was waged fiercely, with the Fokker triplane dazzlingly elusive. Then, at last, Second Lieutenant A. P. F. Rhys-Davids, of No. 56 Squadron, got into a favourable firing position. What happened next is told in an extract from his combat report: ' . . . The red-nosed Albatros and the triplane fought

'magnificently. I got in several good bursts at the triplane, 'without apparent effect, and twice placed a new Lewis 'drum on my gun. Eventually I got east and slightly above 'the triplane and made for it, getting in a whole Lewis 'drum and a corresponding number of Vickers into him. 'He made no attempt to turn, until I was so close to him 'I was certain we would collide. He passed my right-hand 'wing by inches and went down. I zoomed. I saw him 'next with his engine apparently off, gliding west. I dived 'again and got one shot out of my Vickers; however, I re- 'loaded and kept in the dive. I got in another good burst 'and the triplane did a slight right-hand turn, still going 'down. I had now overshot him (this was at 1,000 feet), 'zoomed, but never saw him again. Immediately after- 'wards I met the red-nosed scout, who was a very short 'way south-east of me. I started firing at 100 yards. The 'E.A. [enemy aircraft] then turned and fired at me. At '30 yards range I finished a Lewis drum and my Vickers 'stopped, so I dived underneath him and zoomed. When 'I looked again, I saw the E.A. spiralling down steeply out 'of control.'

Captain McCudden watched the triplane dive into the ground on the British side of the lines where it seemed to 'disappear into a thousand fragments'. When the remains of the German pilot were examined, he was identified as Fliegerleutnant Werner Voss, who was, at the time of his death, second on the list of successful German fighting pilots with forty-nine Allied aeroplanes to his credit. Voss, one of a family of fighting sons of a dye-works proprietor of Crefeld, was twenty years old at the time of his death. He had been attached to the German air service, from a Hussar regiment, in August 1915. He became a non-commissioned officer pilot in May 1916, but was promoted to commissioned rank in September of the same year. He shot his first aircraft down in November 1916 and his subsequent rise to prominence was rapid. His name appeared repeatedly in the German communiqués—especially in the spring of 1917 when he contributed much to the temporary dominance of the German air service—and he had been decorated with the order *Pour le Mérite*.

In his career and in his character he had much in common with McCudden, who wrote: 'As long as I live I shall never forget my admiration for that German pilot, who, single-handed, fought seven of us for ten minutes, and also put some bullets through all of our machines. His flying was wonderful, his courage magnificent, and, in my opinion, he was the bravest German airman whom it has been my privilege to see fight.'¹

The bomb raids on the 24th and 25th of September were directed chiefly against the German aerodromes and against railway junctions. The main aerodrome targets were Marcke (four 230-lb. and four 112-lb. bombs), Abeele (five 230-lb., thirty-six 25-lb.), and Lichtervelde (two 230-lb., twenty-eight 25-lb.). No. 27 Squadron attacked Ath station on the 24th (six 230-lb., three 112-lb.) and No. 55 Squadron bombed Melle sidings (three 230-lb., four 112-lb.) and the Gontrode airship shed² on the 25th. On both these days the bombing activities of No. 57 Squadron were confined to the billeting village of Hooglede on which a total of seven 230-lb. and eight 112-lb. bombs was dropped. The photographic reconnaissances were numerous on both days and about 2,500 plates were exposed over the enemy positions. On the 25th, particularly, German airmen were active, but the air combats mostly terminated in favour of the Royal Flying Corps. Nineteen out of thirty-two German aeroplanes driven down on this day were seen to crash, while the Royal Flying Corps casualties were one aeroplane missing, two pilots and one observer killed, and three officers wounded.³

The Battle of Polygon Wood, 26th September–3rd October

The heavy fighting resulting from the German counter-attacks on and after the 20th of September was not allowed to interfere with the preparations for the renewal

¹ *Five Years in the Royal Flying Corps*, by J. T. B. McCudden, p. 242.

² See p. 197.

³ The total battle casualties of the twenty-six squadrons in the battle of Menin Road Ridge were sixty-two pilots and observers killed, wounded, or missing.

of the advance, to be made by the Second Army with the support of the right Corps of the Fifth Army. This began on the morning of the 26th from south of the Menin road to a point north-east of St. Julien, a distance of rather less than six miles. On the right a short advance only was needed to capture the high ground which covered the German local movements from all except air observation, but north of the Menin road a deeper bite into the enemy position was planned with the object of securing a jumping-off place for a direct attack on the main Passchendaele ridge.

During the night, while the infantry were awaiting 'zero' hour, the bombing aircraft of Nos. 100 and 101 Squadrons went to and from the enemy billeting and railway centres on which they dropped a total of nearly five tons of bombs.¹ Seven thousand rounds of machine-gun ammunition were fired, in addition, at ground targets, particularly troops and transport on the roads, and 70 one-pounder pom-pom shells were fired at transport by an F.E.2b pilot of No. 100 Squadron. A local fog, which came up without warning while some of the aircraft were away bombing, led to five crashes in forced landings with consequent injury to one pilot and two observers. The fog also curtailed the bombing activities of No. 101 Squadron.

As the infantry clambered from their trenches at 5.50 a.m. on the 26th, the clouds were low and made difficult the work of the co-operating aircraft. Nevertheless, the contact-patrol and artillery observers were able to report the progress of the battle, while the low-flying fighting pilots, from an average height of 300 feet,

¹ No. 100 Squadron dropped twenty-three 230-lb., four 112-lb., and one hundred and forty-eight 25-lb. bombs: on Wervicq (eight 230-lb., twenty-six 25-lb.), Menin (six 230-lb., two 112-lb., thirty-two 25-lb.), Gheluwe village (one 230-lb., three 25-lb.), Wervicq-Gheluvelt and Wervicq-Zandvoorde roads (six 230-lb., seventy 25-lb.), Becelaere village (three 25-lb.), Menin-Gheluvelt road (six 25-lb.), billeting huts at Tenbrielen (eight 25-lb.), at Kruiseik (two 112-lb.), and on Zandvoorde village (two 230-lb. bombs). No. 101 Squadron bombed Menin (one 230-lb., four 25-lb.), Oostnieuwkerke (four 112-lb.) and Hoogdele (two 112-lb.). During this same night Naval Handley Pages dropped 9½ tons of bombs on the Thourout-Cortemarck-Lichtervelde triangle (see p. 98).

26 Sept.

attacked troops and batteries. During the day 193 active German batteries were reported to the artillery by zone call, while thirty-nine other batteries were engaged, with aeroplane observation, for destruction, and twenty-eight for neutralization.

Once again the infantry achieved a tactical success. Australian troops carried the remainder of Polygon Wood with the German trench line to the east of it, and established themselves along their objectives beyond the Becelaere-Zonnebeke road. On the left of the Australians English troops captured a long line of strong-points. South of Polygon Wood the struggle was long and fierce, but most of the fortified farms and other strong-points were taken, although the line of objectives in this locality was not completely won until the evening of the next day.

The feature of the day's fighting was the defeat of the numerous enemy counter-attacks, due, in part, to the warnings given by the air observers. An appreciation of the attack compiled by the General Staff of the Second Army recorded: 'As to the employment of his supports and reserves, the enemy again followed the same tactics as before. His local reserves, especially north of Polygon Wood, were employed in small counter-attacks by 9 a.m., while his larger forces comprised in his Counter-Attack Divisions were not brought in until noon or afternoon as was anticipated. It is now evident that the prompt location of these by the Royal Flying Corps and the very effectual way in which they were dealt with by our artillery caused tremendous casualties to the enemy and prevented their developing counter-attacks at close quarters; there is evidence that a large counter-attack, involving several battalions, was ordered for 5 o'clock in the afternoon against our positions north of Polygon Wood but did not materialize.'

The battle of Menin road on the 20th had disclosed that the enemy attached great importance to the Tower Hamlets ridge. The air reports throughout the 26th of September revealed intense activity on the roads south-east of Zandvoorde, and heavy concentrations of artillery behind Tenbrielen, from which the Second Army Staff

concluded that strong counter-attacks against the Tower Hamlets ridge must again be expected on the evening of the 26th. On the air information, annihilating artillery fire was brought to bear on the enemy troops, assembled and deploying, with the result that the attack, launched about 7.30 p.m., was so disconcerted that few elements got to close range. 'The 26th', says General Ludendorff, 'proved a day of heavy fighting, accompanied 'by every circumstance that could cause us loss. We 'might be able to stand the loss of ground, but the 'reduction of our fighting strength was again all the 'heavier. . . . The depth of penetration was limited so 'as to secure immunity from our counter-attacks, and the 'latter were then broken up by the massed fire of artillery.'¹

A study of the reports of the low-flying fighting pilots makes it clear, also, that the German troops brought up for counter-attack suffered casualties before they had to meet the British artillery fire. As was done for the attack on the 20th, tactical maps were supplied showing the enemy assembly points and routes of approach, and the area was divided into sections which were specifically allotted for the special attention of the low-flying patrol pilots. Many parties of German infantry marching behind the battle-front were found and scattered with light-weight bombs and machine-gun fire. Other targets included active batteries and machine-guns, and troops entrenched or holding strong-points in the forward areas.

The enemy also attempted low-flying attacks, with intermittent success, on the advancing British infantry. On the front of the Second Army five of the low-flying German aeroplanes were shot down by machine-gun fire from the ground. In air fighting six aeroplanes were destroyed by Flying Corps and naval pilots, all in the battle area.

Bombing attacks, owing to the low clouds, could not be made according to programme. Low-flying attacks had been ordered against the main German aerodromes (Rumbeke, Abeele, Ingelmunster, Heule, Marcke, Cuerne, Abeelhoek, Bisseghem, and Harlebeke), each to be attacked

¹ *My War Memories*, pp. 488-9.

26 Sept. by one fighter pilot. Only three of these aerodromes were attacked, namely, Abeele, Abeelhoek, and Rumbeke. The head-quarters day-bombing squadrons (Nos. 55 and 27) were to attack Heule, Abeelhoek, Bissegheem, and Abeele aerodromes, and the day-bombing squadron of the V Brigade (No. 57) had for target billets near Moorslede. No. 57 Squadron, despite the unfavourable conditions, successfully bombed Moorslede, and No. 27 Squadron attacked Bissegheem aerodrome. Other pilots of the squadron attacked Tronchiennes station, near Ghent, and the aerodrome at Gontrode.¹

An offensive patrol formation of No. 56 Squadron attacked a group of enemy bombers, escorted by eight fighters, as they were about to cross the lines. The S.E.5 pilots attacked so strongly that the German two-seaters were induced to drop their load of bombs on their own side of the lines. The enemy aircraft were eventually driven off without any apparent casualties.

The operation orders of the Royal Flying Corps had instructed the two night-bombing squadrons, Nos. 100 and 101, to pay 'special attention to the attack of troops', during the night following the first day's fighting, on the Menin-Gheluvelt, Wervicq-Gheluvelt roads, and on roads in the Roulers, Hooglede, and Passchendaele areas. The squadrons were also to attack railway stations and trains.² The pilots of the two squadrons spread their attacks over most of the night, and dropped three 230-lb. and seven 25-lb. bombs on Wervicq town and station, and five 230-lb., sixteen 112-lb., and sixteen 25-lb. bombs on troops and transport on roads in the specified areas.

Up to the 30th of September, by which time the enemy had made some recovery from the disorganization caused by his defeat of the 26th, there was relative quiet along the front. The enemy air activity, during this brief interlude, was below normal, but there was no slackening of effort by the Royal Flying Corps squadrons. The routine of artillery

¹ See p. 197.

² No. 100 Squadron in the area Wervicq-Halluin-Courtrai-Ledeghem, and No. 101 Squadron in the area Hooglede, Westroosebeke, Passchendaele-Rollegheemcappelle.

co-operation, and of reconnaissance and photography, was maintained. During the night of the 27th/28th there were widespread bombing attacks, in which many of the Corps squadrons took part, on the enemy road and railway communications, and on billeting centres, and during the 28th, which was a fine day, twenty separate bombing attacks were made in strength.

There were a few concentrated air fights by formations on the 28th and in these the German airmen suffered severely. The Bristol Fighter and the S.E.5 had the measure of the best of the enemy's fighters. In one encounter, on the 28th, south of the main battle area, between a formation of nine Albatros Scouts and four Bristol Fighters of No. 11 Squadron, together with eight D.H.5's of No. 41 Squadron, the German pilots, although they fought with courage, were routed and apparently one only survived. Three were destroyed in the air and five sent down out of control. On the same day a formation of S.E.5's, led by Captain J. T. B. McCudden, attacked a group of hostile fighters in the Ypres area and destroyed five of them, without loss to the S.E.5's. One of the German aeroplanes shot down by McCudden broke up in the air, the pilot falling from the wreckage from a height of 8,000 feet.¹

On the 30th of September the enemy resumed his counter-attacks, with the aid of *Flammenwerfer*, north of the Menin road, and these were followed by five other attacks in the same area on the 1st of October, and by a sixth attack on the same day south of the Ypres-Roulers railway. Except for the temporary loss of two advanced posts south-east of Polygon Wood, the attacks were repulsed by artillery and machine-gun fire. On the 3rd of October the final German attack of this series, again made in the neighbourhood of the Menin road, met a similar fate. The mornings on which these various enemy attacks were made were misty, but, except on the 3rd of October, the weather cleared towards noon, and a great amount of

¹ Captain McCudden had, on the previous day, while testing his engine in the air, shot down an enemy two-seater, his first victim to fall in the British lines.

air work—particularly observation of artillery fire, and photography—was accomplished.

Development of Night Flying

September 1917 was notable for an extension of night flying. Reference has already been made to the bombing operations of Nos. 100 and 101 Squadrons, but night attacks were not confined to these two squadrons. While the Corps squadrons in the battle area were fully occupied with their day-time co-operation with the artillery and infantry, those elsewhere along the front, in the I and III Brigades, had the opportunity to develop night-bombing attacks calculated to help the main offensive. R.E.8's and Armstrong-Whitworths of these Corps squadrons began their raids on the 5th/6th of September, and gradually, as the month wore on, widened the scope of their efforts to include machine-gun attacks on road traffic. The German air service also expanded its night-bombing activities, and attacks on the British lines of communication, particularly at St. Omer and its neighbourhood, were made with increasing frequency.

For a time the bombers had only to reckon with anti-aircraft gun-fire, because it was believed that the unstable single-seater fighter could not operate at night with safety or success. But this view was shown to be ill-founded, and the discovery was made simultaneously in the field and at home. When the German night-bombing squadron, operating from Belgium, began a series of attacks on England on the 2nd of September the defences were unprepared, but when the bombers appeared again on the following night, three 'Camel' pilots of one of the home defence squadrons sought and obtained permission to intercept the raiders. In this they failed, but they demonstrated that the 'Camel' could safely be flown in the dark, a fact which was also made clear during the same night in France by two 'Camel' pilots of No. 70 Squadron who tried, unsuccessfully, to attack German aircraft which bombed St. Omer. About this time also, No. 48 Squadron, in the Dunkirk area, began to send up Bristol Fighters at night to intercept the German bombing aeroplanes which

raided Dunkirk. A scheme of defence against night-bombing aircraft was thereupon worked out, both in the field and in England, by which the activities of searchlight and gun-crews were carefully co-ordinated with those of the fighting pilots.

Meanwhile, other measures were taken to combat the German raiders. The German night-bombing squadron—No. 3—responsible for the attacks on England, was housed at the former airship station at Gontrode (head-quarters and four Flights) and at St. Denis Westrem (two Flights),¹ and it was decided to make a series of intensive attacks on these aerodromes. The Royal Naval Air Service units at Dunkirk were allotted St. Denis Westrem as objective, and the Flying Corps bombing squadrons were given the target of Gontrode. On the 25th of September five D.H.4's of No. 55 Squadron dropped two 230-lb. and six 112-lb. bombs on Gontrode, and, next day, No. 27 Squadron dropped two 112-lb. bombs on the same target. On the 27th, in two attacks, ten 112-lb., forty-four 25-lb., and three hundred and ninety-seven Ranken darts were dropped by No. 55 Squadron, and, during the night of the 27th/28th, three pilots of No. 101 Squadron added two 230-lb., two 112-lb., and four 25-lb. bombs. Next day, the 28th, the pilots of No. 55 Squadron were over the target again and dropped six more 112-lb., twelve 25-lb., and one hundred and ninety-nine Ranken darts. In the same period two attacks were made on St. Denis Westrem to supplement the efforts of the Naval Air Service units: by No. 27 Squadron on the 27th of September, and by No. 100 Squadron during the night of the 28th/29th. During the 29th/30th Gontrode was attacked again by Nos. 100 and 101 Squadrons with bombs and pom-pom shells, and, in two daylight raids on the 30th, by No. 55 Squadron (twelve 112-lb., forty-eight 25-lb., and three hundred and ninety-eight Ranken darts). Next night the F.E.2b pilots went again, and, on the 1st of October, the de Havilland pilots of No. 55 Squadron paid their last visit of this series to Gontrode.

¹ This squadron had been increased from three Flights (of six aeroplanes each) to four in June 1917 and to six in July.

One of the results of this intensive day and night bombing, which gave the enemy little chance to repair the moral and material damage inflicted, was the transfer of two of the four Flights from Gontrode to a new aerodrome north-east of Ghent, and of the two Flights from St. Denis Westrem to another aerodrome at Mariakerke.¹

At the beginning of October night bombing became an added duty of the single-seater fighters. As an experiment Sopwith 'Pups' of No. 66 Squadron, carrying 25-lb. bombs, were sent, at dusk, to attack German aerodromes. The first attempt, on the 1st of October, was made abortive by a thick mist, but, next evening, three 'Pup' pilots reached the aerodromes at Cruyshautem and Waereghem, north-east of Courtrai, and successfully bombed them from a low height: at the latter aerodrome a hangar was hit and set on fire. This success followed on another achieved by two 'Camel' pilots of No. 8 (Naval) Squadron, working in the I Brigade area. They had set out at 9.45 p.m. on the 29th of September, one to attack a balloon shed near Quiéry-la-Motte, and the other to attack the German aerodrome at Douai. The first pilot found his objective and put a burst of a hundred rounds from his two Vickers guns into the shed from thirty feet. The balloon or balloons which it housed were set on fire and masses of flame lit up the surrounding countryside. The second pilot, who failed to find the Douai aerodrome turned back, attracted by the fire, and by its light dived repeatedly and attacked the balloon personnel who had rushed from their quarters.

In an encounter on the 30th of September a patrol of No. 56 Squadron routed a formation of German fighters

¹ The British counter-measures now took a wider form. On the 11th of October 1917 the Forty-First Wing was formed with the special object of bombing targets of military importance in German territory. The headquarters of the Wing were at Bainville-sur-Madon, south-west of Nancy, and the commanding officer was Lieutenant-Colonel C. L. N. Newall. The Wing began with two bombing squadrons transferred from the Ninth Wing—Nos. 55 and 100—and with Naval 'A' Squadron (afterwards No. 16 Naval Squadron) of Handley Pages: the aerodrome was at Ochev. Such was the beginning of the Independent Force.

after destroying two of them. This success brought the total number of enemy aeroplanes accounted for by No. 56 Squadron, since its arrival in France in April 1917, to two hundred (destroyed and out of control). It so happened that when the squadron first appeared on the Western front the Richthofen 'Circus' was at the height of its achievement. The coming of this new squadron led the enemy to believe, erroneously, that No. 56 had been specifically formed, from selected prominent pilots, as an 'Anti-Richthofen-Circus', and this belief persisted throughout the war. The formation and early record of the squadron, therefore, deserve brief examination.

The reader will recall that towards the end of the Somme battles in 1916 there had appeared on the Western front a new type of German single-seater fighter, a Halberstadt fitted with twin Spandau guns built into the fuselage to fire through the propeller. The effect of these fighters on the air situation had been immediate. Up to the spring of 1917 the single-seater fighters of the Royal Flying Corps, and of the Royal Naval Air Service units in France, were armed with one fixed machine-gun only. Thus handicapped they had, especially in April 1917 during the Arras battles, suffered severely. The first British fighter to arrive in the field with twin side-by-side fixed Vickers guns was the Sopwith 'Camel' (130 horse-power Clerget engine), and No. 70 Squadron, the first Royal Flying Corps unit to be re-equipped with 'Camels', had received its complement of new aeroplanes by the end of July 1917, by which time, also, the re-equipment of No. 45 Squadron with the same type was nearly complete.¹ Pending the arrival in France of the 'Camel', the S.E.5 constituted the British answer to the German twin machine-gun fighters. The S.E.5 was armed with one built-in Vickers gun for fire through the propeller, and one Lewis gun capable of

¹ An improved type of Spad, fitted with a 200 horse-power Hispano-Suiza engine, and armed with twin side-by-side fixed Vickers machine-guns, was taken into service by the Flying Corps in France about the same time. No. 19 Squadron received the first of the type in June 1917, but it was not until November 1917 that any considerable numbers of this type were brought into use in France.

forward fire from a modified Foster mounting above the centre section. No. 56 Squadron, the first to be equipped with the S.E.5,¹ arrived in France on the 7th of April 1917. The squadron had been formed under the parentage of No. 28 Squadron at Gosport in June 1916, and had moved to London Colney in the following month. During its months of preparation for overseas, the squadron had a shifting personnel of officers and was equipped with various types of aeroplane. Early in February 1917 the command was taken over by Major R. G. Blomfield, and, on the 13th of March, the squadron received the first of its S.E.5's. Others arrived daily and, at the end of the month, No. 56 was ordered to mobilize. One of the Flight Commanders, posted to the squadron on the 26th of February 1917, was Captain Albert Ball, the foremost fighting pilot of his time in the Royal Flying Corps, and some other pilots of the squadron had likewise already achieved distinction in France. No. 56 Squadron made its first active service patrol—with orders not to cross the lines—on the 22nd of April. The next day the first offensive patrol by pilots of the squadron was made under the leadership of Captain Ball, who, during a subsequent fight with a German formation, drove one enemy aeroplane down in flames and another to crash on the ground. Thereafter the pilots of No. 56 Squadron, except for a brief spell of home defence duty in England, were in the thick of the fighting in France. While the squadron was on temporary duty in England, Captain McCudden, at that time instructing at home, but already known for his exploits as a fighting pilot, visited its aerodrome. 'There was a wonderful 'spirit in this squadron', he says, 'which was entirely 'different from any squadron with which I had yet come 'in contact. . . .'² Major Blomfield applied for the services of McCudden, who was posted to the squadron as a Flight-Commander in August 1917.

¹ Early in June 1917 No. 56 Squadron received the first of an improved type of S.E.5 with which it was completely re-equipped in August. This was the S.E.5a, the modification being a 200 horse-power Hispano-Suiza engine in place of the 150 horse-power model.

² *Five Years in the Royal Flying Corps*, p. 191.

While it is just to point out some of the advantages of No. 56 Squadron and to praise its achievement, it would be wrong to imply that other squadrons were inferior, except, possibly, in opportunity. The Royal Flying Corps differed from other air services, both Allied and enemy, in that it was not British policy to extol the achievements of individuals or of specific units. Sir Douglas Haig, in forwarding a summary of the work of the Royal Flying Corps during the Ypres battles for the month of September 1917, had something to say on the subject, previously raised by the authorities in London, of publishing in the newspapers the names of pilots who did specially good work. 'The matter has had careful consideration in France for a 'long time', he wrote to Sir William Robertson, Chief of the Imperial General Staff, 'as a result of which the 'General Officer Commanding Royal Flying Corps, with 'my full approval, is entirely averse to any such publica- 'tion. . . . I am strongly of opinion that it would be both 'unwise policy and unfair to other branches of the Service 'to differentiate the treatment of the Royal Flying Corps 'in this manner from that which applies to the Army 'generally. Any such special treatment would be in- 'vidious and likely to cause justifiable jealousy, both inside 'and outside the Flying Corps. The fact that it is done in 'the case of certain other armies would not justify a de- 'parture from the well-established customs of the British 'Army, and I feel sure that the best opinion in the Royal 'Flying Corps itself would not be in favour of a system 'which is not in accordance with the traditions of the 'British Army but, on the contrary, that the officers of the 'Royal Flying Corps are proud of being anonymous like 'their comrades in other branches of the Service. I may 'add that the work of the Royal Flying Corps is now carried 'out so much in formations rather than individually that it 'would frequently be impossible to select special in- 'dividuals for particular mention. . . .'

The memorandum which accompanied the letter, summarizing the work of the Royal Flying Corps, gives some interesting statistics for the month of September 1917. These show that in 226 bombing attacks by day and night,

7,886 bombs of a total weight of 135 tons, were dropped on enemy targets. This compares with 969 bombs dropped by German airmen in the same period on targets within the British lines. Royal Flying Corps pilots and observers helped to range the British artillery on 9,539 targets, chiefly German batteries. The number of German batteries ranged during September, with the help of aircraft wireless observation, was 743. In connexion with their work for the Army, Royal Flying Corps squadrons exposed 14,678 photographic plates and distributed 346,999 prints. The two large aircraft depots feeding the squadrons in the line, working day and night, standardized and issued 930 aeroplanes, in the same brief period, reconstructed 116 (a process requiring 2-4 weeks' work) and erected 113. 'At the beginning of September', states the memorandum, by way of comment on the value of the air offensive, 'the Germans concentrated in great force on our front and were active over our lines, and their low-flying machines were fairly numerous. But, towards the end of the month, the majority of the German machines were found much further back behind their lines, although a number came over the line. Most important of all, thanks to the offensive action of the fighting patrols, the artillery machines were able to carry out their work of ranging unmolested by the enemy during the battles of the 20th and 26th September. . . .'

Broodseinde and Poelcappelle—4th and 9th October

4 October

On the 4th of October the spell of comparatively fine weather ended, but the operation, planned for the morning of this day against the main line of the ridge opposite Zonnebeke, was duly made. The front of attack extended about seven miles from the Menin road to the Ypres-Staden railway, with a minor attack on a short front south of the Menin road to capture certain strong-points. Under conditions of weather and ground which inflicted great hardship, the infantry pushed forward with success. It so happened that three fresh German divisions had been brought into the line for an attack timed to take place at 6.10 a.m., ten minutes after the British 'zero' hour. The

result was that the artillery barrage caught the German *4 October* infantry when they were forming for the assault, and, before they could recover from their confusion, the British infantry were on them. By midday, after determined fighting, in which the enemy casualties were heavy, all the main objectives had been captured, and they were held against counter-attacks made in the afternoon and evening.¹

High winds, rain, and clouds down to within 400 feet of the ground, made distant air work impossible on the 4th, and greatly restricted what could be done immediately above the battle area. The artillery aeroplane observers sent down a total of forty-nine zone calls for fire on enemy targets, and, by prearrangement, helped to engage twenty-six targets for destruction. Five battle-field reconnaissances were made and there were ten successful contact patrols and two counter-attack patrols during the day. Not much, but representative of a determined effort to give a measure of support to the infantry under conditions of extreme difficulty.

The Broodseinde success marked a turning-point in the Flanders operations. The British line had now been advanced along the main ridge for 9,000 yards from the starting-point near Mount Sorrel, and the capture of the Gravenstafel spur ensured a good defensive flank. The year was already far spent and the prospect of driving the enemy from the Belgian coast had long since disappeared. The continuous delays in the advance as a result of the weather and its effect on the state of the ground, had given the enemy time, after each attack, to bring up reinforcements and to reorganize his defences. Although General Head-quarters now recognized that the major objectives of the Flanders operations were impossible of attainment, they were still anxious to continue the operations with a view to the capture of the remainder of the Passchendaele ridge before winter set in.

¹ 'The infantry battle commenced on the morning of the 4th. It was 'extraordinarily severe, and again we only came through it with enormous 'loss. It was evident that the idea of holding the front-line more densely, 'adopted at my last visit to the front in September, was not the remedy.' (Ludendorff, *My War Memories*, p. 490.)

The weather was entirely unfavourable, but there were hopes that it would improve, hopes based on the somewhat slender foundation that the abnormal rainfall of the summer presaged a normal, perhaps even a dry, autumn. And if the weather played its assigned part there were many reasons why the offensive should not be stopped. The capture of the whole of the Passchendaele ridge would secure the British position for the winter and make more difficult the position of the enemy. Furthermore, the French armies, not yet fully recovered from the internal disturbances resulting from the Nivelles failure of the spring, were planning an attack on the Aisne heights for the 23rd of October. After weighing these and all the other considerations, Sir Douglas Haig judged that he must continue the offensive with the double object of capturing Passchendaele and of attracting the German reserves to the British front.

9 October

The decision having been made, the operations went ahead although the weather did its worst. At 5.20 a.m. on the 9th of October, after two days of continuous heavy rain, the attack was renewed on a six-mile front from a point east of Zonnebeke to the junction with the French north-west of Langemarck. On the British left the French prolonged the front of attack to a point opposite Draaibank, while, on the right of the main attack, minor operations were undertaken east and south-east of Polygon Wood. The infantry captured and held their objectives and put themselves within striking distance of the higher ground running north from the Ypres-Roulers railway through Passchendaele and Westroosebeke. In the subsidiary attack, east of Polygon Wood, the recapture of the village of Reutel, part of which had already twice changed hands, was completed.

Except on the actual battle-front little flying was attempted. Over the advancing infantry every risk was taken by the pilots and observers of the II and V Brigades. As a result of fifteen contact patrols and seventeen counter-attack patrols, made at low heights, the progress of the infantry was reported with general, and sometimes detailed, accuracy, and artillery fire was brought to bear on

a great number of active batteries and parties of German troops. By the observers in these aeroplanes and those in the artillery aeroplanes, three hundred and fifty-four zone calls were sent by wireless to the artillery indicating important targets. In addition, twenty-one German batteries were successfully engaged for destruction with air observation, and thirty-three for neutralization, and there were, in consequence, eighteen explosions and sixteen fires in the German gun-pits. The work of No. 9 Squadron was outstanding: in their determination to report the progress of the infantry of the XIV Corps with which the squadron co-operated, and to keep watch on the German counter-attack movements, the pilots flew with great persistence in and through the barrage. They and their observers gave invaluable information at a cost of two officers killed, two missing, and one wounded. While the Corps aeroplanes were working over the battle-field, pilots and observers of No. 57 (D.H.4) Squadron made seven reconnaissances well back into the German lines, and paid visits, with bombs, to the village of Staden on which a total of six 230-lb. and fourteen 112-lb. bombs were dropped: one bomb caused a fire which burned for some hours.

What little air fighting there was on the 9th chiefly involved No. 1 (Nieuport Scout) Squadron. One patrol of this squadron, in an encounter with nine enemy fighters, destroyed one and sent down another out of control. Another patrol, in a fight with five German aircraft, destroyed two in flames, from which the pilots jumped or fell out, and shot down another, which was last seen falling out of control into the clouds. These successes, for which the squadron paid with one pilot missing and another wounded, brought the total of German aircraft, destroyed or sent down out of control by No. 1 Squadron since the 15th of February 1917, the day on which it began work as a fighter squadron, to two hundred.

The best that could be said of the conditions for a further infantry advance was that they were not yet impossible. The next attack was planned for the morning of

12 October the 12th of October, but throughout the previous night there was unceasing rain, and this continued, except for a brief interval, all day on the 12th. The attack was launched to time at 5.25 a.m. between the Ypres-Roulers railway and Houthulst Forest, and some progress was made on the higher ground, but the flooded valleys westward of the main ridge proved impassable and the further advance was cancelled. While the infantry were floundering in the mud, the pilots and observers did what they could to help. No fewer than forty-one pilots, representing ten squadrons, added to the misery of the defending German troops by their low-altitude machine-gun and bombing attacks. There were twenty-seven contact and counter-attack patrols, and one hundred and twenty-four zone calls to the artillery for fire on active batteries, troops, transport, and machine-gun posts. 'The very active movement', says a Second Army Intelligence Summary of the attack, 'of troops and transport about the areas known to be occupied by counter-attack divisions was particularly noticeable quite early in the day, and notwithstanding the difficulties of aerial observation, this movement appears to have been greater than that observed in any of the recent operations.' Concentrations of German troops in shell-holes east and south-east of Passchendaele were also reported by air reconnaissance at 1.20 p.m. and were severely shelled by the British artillery. In spite of these definite indications that strong counter-attacks might be expected, none of importance developed. The enemy troops were heavily fired upon, and the inference is that as the British made little progress, the enemy was unwilling to court further severe casualties in the attempt to wrest from us what little we had gained. Had the British advance been continued in the afternoon, no doubt the German counter-attack troops would have been ordered to attack. With the help of the air observers, twenty-six hostile batteries were engaged for destruction, and thirty-seven for neutralization, as a result of which explosions were caused in twenty-two German gun-pits and fires in five others. There were four bomb raids on rest camps and railway centres (notably, Ledeghem station—eight 112-lb.

bombs), eight reconnaissances, and a dozen or so combats. Although there was no great opposition by enemy airmen, the casualties, in these various attempts to co-operate in the attack under weather conditions bordering on the impossible, were high. Fourteen officers were missing at the end of the day, and five others had been wounded.

Sir Douglas Haig now relinquished hope that the ground would recover sufficiently to allow of the whole of the main ridge being captured before the end of the year. He did, however, deem it necessary to maintain the pressure, on a limited scale, in intervals of better weather, both to help the forthcoming operations by the French and to cloak his own intentions to strike an unexpected blow at Cambrai.

On the 22nd of October, after a few days of slightly improved weather, there were two successful operations by which important ground east of Poelcappelle and within the southern edge of Houthulst Forest was gained. On the previous days there had been a great amount of air photography, and of artillery co-operation, and there had been intermittent bombing, particularly of the German aerodromes. One such attack, against the aerodrome at Rumbeke, made on the 20th of October, deserves detailed consideration.

Lieutenant-Colonel F. V. Holt, commanding the Twenty-second (Army) Wing, had, in consultation with his squadron commanders, devised a scheme earlier in the year for the periodical employment of the maximum fighting strength of the Wing in 'drives' over the German back areas. The idea was to 'net' as many enemy airmen as possible, and the scheme was, therefore, only to be put into force if and when the German air service was sufficiently active to warrant an operation on such a scale. The scheme was not put into effect, but many of its features were embodied in the attack on the Rumbeke aerodrome on the 20th of October. Forty-five aeroplanes took part in the operation, namely, eleven 'Camels' of No. 70 Squadron (each carrying two 25-lb. bombs), with eight 'Camels' of the same squadron in close escort; nineteen 'Camels' of No. 28 Squadron¹ which were to come

¹ No. 28 Squadron arrived in France from England on the 8th of

in from the rear to attack German aircraft which left the ground; and seven Spads of No. 23 Squadron to act as a high offensive patrol to cover the whole operation. The attack met with considerable success. Twenty-two bombs were dropped from a height of four hundred feet: some of them fell among aeroplanes lined up on the landing-ground, and blew one of them to pieces; another bomb burst inside a hangar, but the remainder fell just by the hangars and sheds. The bombing pilots then flew about the aerodrome firing at the personnel and into the hangars and buildings. This machine-gun attack was made at an average height of about twenty feet, and the undercarriages of two of the aeroplanes actually touched the ground. Meanwhile, the escorting pilots of No. 70 Squadron and the patrol of No. 28 Squadron were having many combats within sight of the aerodrome. Four German single-seaters were shot down out of control by the former and three by the latter. The operation was rounded off by machine-gun attacks, on the homeward journey, on troops playing games, on horse-transport, and on a troop train, into the windows of which a pilot of No. 70 Squadron fired from a height of fifty feet. Two aeroplanes of No. 70 Squadron were missing, but there were no other British casualties as a result of the raid.

On October the 21st, a day of fair weather, much air work was done in preparation for the infantry attack on the following day. This included the taking of 1,304 photographs, observation for destructive fire on sixty-seven German batteries, and bombing attacks on various targets, chiefly aerodromes. During the night of the 20th/21st No. 101 Squadron dropped three 230-lb., eight 112-lb., and four 25-lb. bombs on Ingelmunster station and aerodrome, and No. 102 Squadron¹ dropped four 112-lb. bombs on Bissegghem aerodrome where an aeroplane on the ground was destroyed and a petrol store set on fire. On transport

October. This was its first operation over the enemy lines. The squadron was transferred to Italy on the 9th of November 1917.

¹ No. 102 Squadron arrived in France from England on the 24th of September 1917. The squadron was equipped in the field with F.E.2b's (160 horse-power Beardmore engines).

showing lights the same squadron dropped one 230-lb. and two 112-lb. bombs. By day on the 21st Abeele and Heule aerodromes were attacked, the former by No. 57 Squadron and the latter by No. 25 Squadron. There was a considerable amount of air fighting and the Flying Corps casualties were one officer killed, nine wounded, and nine officers, one non-commissioned officer and three mechanics missing: the enemy casualties were ten aeroplanes destroyed.

During the night of the 21st/22nd of October the targets for the head-quarters bombing squadrons were again enemy aerodromes and railway stations. No. 101 Squadron attacked Abeele and Ingelmunster aerodromes and Lichtervelde station. One of the bombs on Ingelmunster exploded among aeroplanes lined up to leave the ground. No. 102 Squadron attacked the aerodromes at Marcke, Bissegheem, and Moorseele, but the chief raid was made against Roulers station.

The infantry assault on the 22nd again coincided with heavy rain, and flying was difficult until the afternoon when the weather improved. Nevertheless, the progress of the infantry was well plotted by the contact-patrol observers, while the fighter pilots, particularly in the afternoon and evening, made many low-flying attacks on German infantry in trenches and shell-holes, on the roads and in villages, and on active machine-guns and batteries. A notable attack was one made on two battalions of German infantry on the Staden-Houthulst road by two 'Camel' pilots of No. 45 Squadron: the enemy troops were eventually scattered. No. 57 Squadron again made a big attack on the billeting village of Hooglede.

On the 25th a strong west wind dried the ground a little, and it was decided to go ahead with the operations planned for the next day. During the night of the 25th/26th German aerodromes were again attacked: Rumbeke and Abeele by No. 101 Squadron, and Bissegheem and Marcke by No. 102 Squadron, which also dropped bombs on Menin station. Some hours before the infantry assault was timed to begin, rain set in once more, but the troops were duly assembled and, at 5.45 a.m. on

the 26th, attacked from the Ypres-Roulers railway to beyond Poelcappelle village. In co-operation with this advance French and Belgian troops on the British left attacked and captured the Merckem peninsula. Through the heavy rain of the 26th the pilots and observers of the Corps squadrons persisted in their duty of artillery co-operation, and of contact and counter-attack patrol, while the Royal Flying Corps and naval fighting pilots devoted their time almost exclusively to low-flying attacks on German troops. By the evening of the 26th the British had captured their objectives, except at Gheluvelt, where, in a subsidiary attack, troops had reached the ruins of the village, but had had to withdraw because they could not fire their mud-choked rifles to stem a German counter-attack.

The 27th of October was a fine day and, although there was comparative quiet on the ground, air activity was intense, and a full day's work was done in co-operation with the artillery. Ninety-five German batteries were engaged for destruction and twenty-one for neutralization with the help of the aeroplane and balloon observers, and in addition, over two hundred targets were reported to the artillery by zone call. There was considerable photography of the enemy positions, over two hundred and fifty bombs of 25-lb. weight, and twenty-three of 112-lb., were dropped on various targets,¹ and 6,000 odd rounds of ammunition were fired by low-flying pilots at troops and at gun emplacements. The enemy pilots made many determined attempts to harass the British forward troops and batteries, which they attacked with bomb and machine-gun fire. The offensive patrols maintained throughout the day had many encounters with German fighters, of which nine were destroyed. The British casualties were one officer killed, nine missing, and nine officers and one mechanic wounded: the missing included Second Lieutenant A. P. F. Rhys-Davids of No. 56 Squadron, the pilot who, in combat a month earlier, had killed the German fighting pilot Werner Voss: it was learned sub-

¹ Chiefly Roulers (seventeen 112-lb. and twelve 25-lb. bombs by Nos. 57 and 25 Squadrons) and Abeele aerodrome (six 112-lb. by No. 25 Squadron).

sequently that Second Lieutenant Rhys-Davids had been shot down and killed in a fight during the morning.

During the night of the 27th/28th Nos. 101 and 102 Squadrons continued the bombing attacks against the German aerodromes and railway junctions, on which thirteen 230-lb., fifty-eight 112-lb., and ten 25-lb. bombs were distributed.¹ The 28th was still fine, but the lines were fog-enshrouded most of the day and little air work was possible. During the night the bombing attacks were continued.

Passchendaele

On the morning of the 30th of October the infantry advance was resumed against Passchendaele itself. At ten minutes to six, when the troops began their attack, the air was clear, but at 10 a.m. rain set in. On the high ground the Canadians advanced, and, after strenuous fighting, reached the outskirts of Passchendaele, but farther north, in an area of swamp, little movement was possible. Enemy aircraft took small interest in the day's fighting and the hundred or so offensive patrols made by the Royal Flying Corps met with little opposition. Nor were there any attempts to molest the artillery and contact-patrol pilots and observers, who, particularly in the morning before the weather broke, gave effective help in the battle.

Some days of dry weather followed, but mist hampered the work of aircraft. On the 6th of November, when the Canadians renewed their attack and captured Passchendaele together with the high ground north and north-west of the village, the weather was again bad and the chief

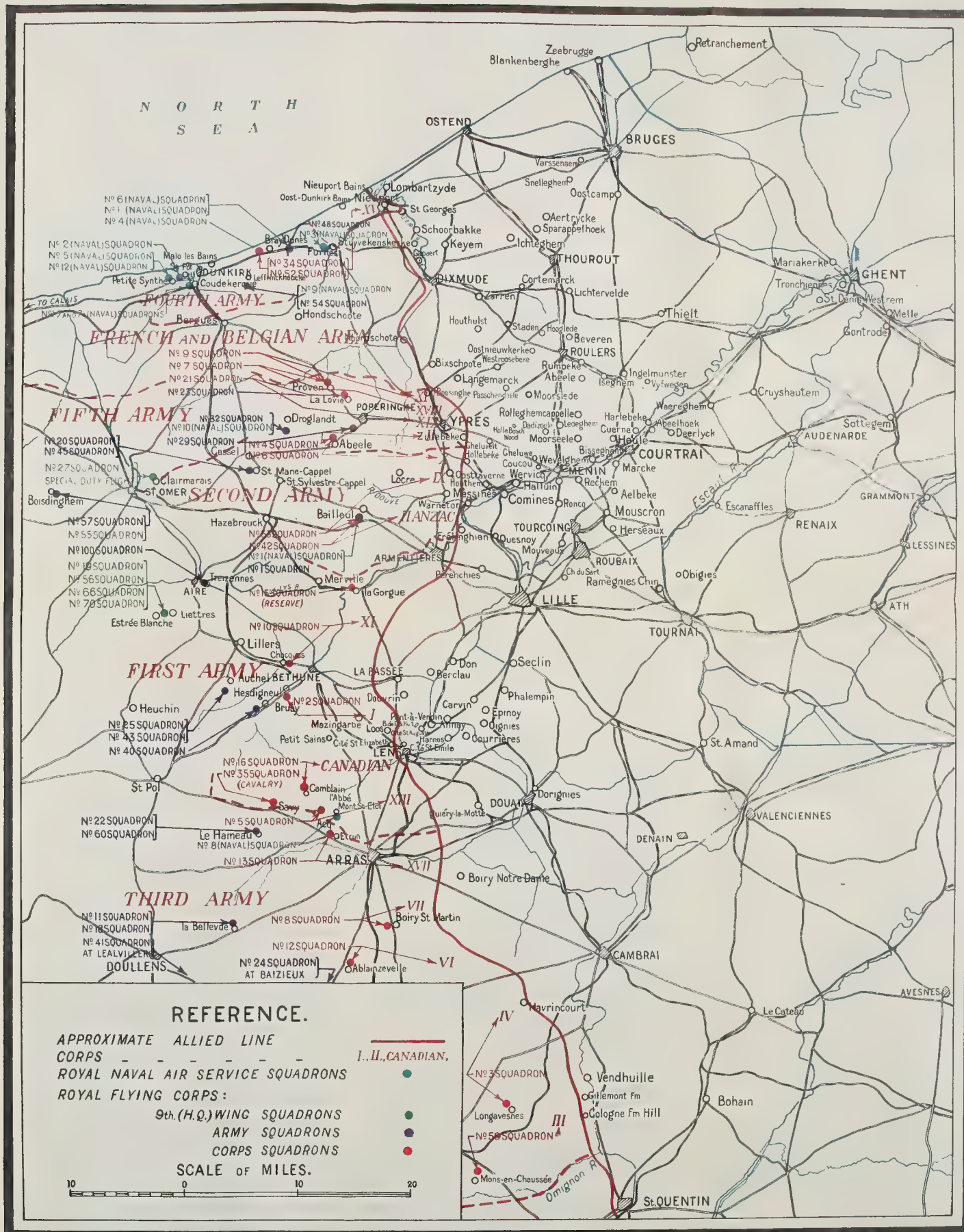
¹ By No. 101 Squadron: *Aerodromes*: Gontrode (one 230-lb.), Rumbeke (six 112-lb., four 25-lb.), Moorseele (four 112-lb.), Abeele (two 112-lb.), and Bisseghem (two 112-lb.). Also Ingelmunster station (twelve 112-lb., two 230-lb.), Iseghem station (four 25-lb.) and various trains (one 230-lb. and twelve 112-lb.).

By No. 102 Squadron: *Aerodromes*: Bisseghem (one 230-lb., four 112-lb.), Marcke (three 112-lb. and one 25-lb.), and Harlebeke (one 230-lb.): also Courtrai station (three 230-lb., five 112-lb., and one 25-lb.), trains (three 230-lb., five 112-lb.), road targets (one 230-lb.), anti-aircraft guns (two 112-lb.), and camp (one 112-lb.).

work of aircraft was the attack of ground targets with machine-gun fire. Upwards of 11,000 rounds were fired at German infantry and active guns by the fighting pilots. The pilots who had to rove about the lines, following no definite course, found the mist and low clouds disconcerting and often had difficulty in deciding where they were. Second Lieutenant E. Olivier, a Spad pilot of No. 19 Squadron, while flying low in search of targets suitable for attack, got lost in the clouds. He steered a course for home, but realized after a time that his compass was misdirecting him and he decided to land. He came to rest on a common and hailed a labourer from whom he inquired whether there were any French or English about. The answer was 'No, only Germans', so he opened his throttle and took to the air again. For some time he flew in what he judged to be a westerly direction, going down, when he found a patch of clear air, to examine the colour of the uniforms worn by such troops as he could find: he eventually crossed the lines near Armentières. On the same day four 'Camel' pilots of No. 3 Squadron, after a varied patrol made difficult by the high westerly wind and the bad visibility, became aware that they were flying north a long way inside enemy territory, but had no clear idea of their position. After fruitless attempts to pick up his bearings the leader decided to land. He chose a suitable piece of ground and all four pilots alighted safely, but subsequent inquiries from civilians indicated that the patrol had strayed far over to the neighbourhood of Namur. Engine trouble kept one of the 'Camels' where it had landed, but the remaining three got away without mishap. Luck, however, was against them. The weather conditions had become worse and, after a further hundred mile flight, the three pilots had to land through petrol shortage. They then learned, after being made prisoners, that they had come down near Rheims. Meanwhile, the pilot who had been left behind near Namur had burned his aeroplane and had then mingled with civilians attracted to the spot. Among these was a young Belgian peasant, with whom the pilot made a verbal contract. The youth promised to conceal and guide the pilot, and the latter to pool his supply of

BATTLES of YPRES, 1917.

DISPOSITION OF ROYAL NAVAL AIR SERVICE AND ROYAL FLYING CORPS SQUADRONS
31st. JULY, 1917.





French francs and help the boy to join a brother who was fighting with the Belgian Army.¹

Four days after the capture of Passchendaele, in a down-pour of rain, British and Canadian troops attacked northwards from the village and extended their gains on the main ridge. The fighting, of intense bitterness, for these additional acres of ground lasted until the late afternoon, and then, as the light faded from the most sombre and bloodiest of all the battle-fields of the war, the last shots of the Battles of Ypres 1917 were fired.

Developments in Artillery Co-operation, 1917

A serious effect of the great increase in the British artillery units in France, which took place in the spring and summer of 1917, and of the frequent transfers of batteries from one command to another, was a weakening of the liaison between the Royal Flying Corps artillery squadrons and the gunners. The time was past when pilots and observers of Corps squadrons could pay frequent visits, for professional discussion, to the batteries with which they worked. This was the more unfortunate because it was found that some artillery officers came to France from England without practical experience of co-operation with aircraft and with little theoretical knowledge of the methods by which it was attained. Brigadier-General P. W. Game, the senior staff officer at Royal Flying Corps head-quarters and himself an officer of the Royal Artillery, had, in April 1917, investigated a specific complaint that a prearranged 'shoot' had failed, and he had found that no wireless station had been erected by the battery, the commander having previously ordered the ground wireless operator to leave his apparatus on the roadside. He also investigated other complaints and found that the failures had been caused because the battery officers did not understand the 'zone call' method of co-operation. In a personal letter to the artillery staff at General Head-quarters, he pointed out how necessary it was that battery commanders, newly arrived in France, should be made conversant with

¹ The initial plans miscarried, but the pilot eventually escaped into Holland. See *Missing*, by Talbot Baines Bruce.

the latest methods of co-operation between aeroplanes and artillery. For a long time senior Flying Corps officers, he said, had paid visits to the batteries to explain these methods, but with the great increase in the number of batteries in the field and, also, in the amount of work required to be done by the Corps wing commanders, this personal liaison was no longer possible.

In June 1917 the General Staff, at the request of Major-General Trenchard, had endeavoured to overcome this lack of understanding on the part of some of the new battery officers, by the issue of a set of notes summarizing the accepted principles for air and artillery co-operation as laid down in the official publications. In truth, the battery commanders had cause for complaint. They, on their part, had sometimes to contend with newly-arrived pilots or observers who were not fully trained in the work of co-operation, and, further, they came to realize, as they moved from one command to another, that the methods in use in the various Corps squadrons of the Royal Flying Corps differed considerably in points of detail. According to the individual experience of the squadron officers, or of the artillery officers with whom they had worked, modifications by way of improvement had been introduced. The battery commander who was shifted from one command to another was apt to find that the methods of co-operation which he had previously practised had to be modified in essential particulars. Such a state of affairs led to annoyance, misunderstanding, and inefficiency. In the middle of August Lieutenant-Colonel E. R. Ludlow-Hewitt, commanding the Third (Corps) Wing, put forward a memorandum which outlined, with force and lucidity, the case for standardization of the methods of ranging for the artillery. 'In the early days 'of co-operation between aeroplanes and Royal Artillery 'batteries', he said, 'every observer and every battery commander had his own pet theories and methods. This fact 'necessitated elaborate arrangements between the observer 'and the battery commander before each shoot could be 'carried out. At that time, these arrangements presented 'no great difficulty because limited time and pressure of

'work were scarcely serious considerations. The observer
'was able to visit the battery commander before a shoot,
'and discuss with him, or was able to ring him up and
'arrange things on telephone lines which were not over-
'congested with traffic. They were further simplified by
'the comparatively small number of batteries which worked
'with aeroplane observation, which allowed one observer
'in the squadron to observe permanently for one battery.
'It was, in fact, almost impossible for him to observe for
'more than one battery, unless he was an expert and
'familiar with all the different methods in use. The result
'of this lack of system was that shoots were, for the most
'part, very slow, and it was considered a good flight when
'some 20 rounds had been fired and observed. Further,
'the number of methods in use rendered it quite impossible
'to teach a new observer all of them, and, if he was trained
'in only one, the chances were that he would be asked to
'work on another when he came to carry out his first shoot.
'Consequently, artillery work was confined to quite a few
'expert observers in each squadron. As work increased the
'three or four experts in the squadron found it impossible
'to compete with it all, and it became more and more
'necessary to train every available observer in artillery
'work. Increase in work, too, began to interfere with
'liaison between individual observers and battery com-
'manders. These considerations, combined with the desira-
'bility of simplifying and improving co-operation, called
'for the introduction of simple standard methods by
'squadrons within the Corps with whom they worked.
'Later again, active operations on a larger scale involving
'complete armies soon showed that standardization within
'armies was both desirable and necessary, not only to
'facilitate the training of observers in a Wing and to
'eliminate methods which experience and comparison be-
'tween Corps began to prove to be faulty, but also to avoid
'a large number of failures which occurred through the
'transfer of batteries or groups from Corps to Corps within
'the Army, due to slight readjustments of the front or to
'the requirements of special operations. Standardization
'of methods of ranging within an Army soon began to show

'the best results in increased efficiency of observers and 'batteries, and a corresponding improvement in the speed 'and effect of the shooting. These improvements were at 'least very clearly demonstrated on the front of the Fourth 'Army during last winter and spring, when the observation 'of upwards of 200 rounds in the course of a single flight 'became as common as the so-called successful shoot of 70 'or 80 observed rounds of a few months earlier. The ad- 'vantages of working on a standard method did not only 'show themselves in the increased speed and destructive 'effect of bombardment with aerial observation, but also 'allowed each squadron to double the amount of work they 'had previously been capable of. This was the natural out- 'come of simplifying and reducing the number of methods 'to be taught, so that observers could be made use of much 'earlier than heretofore.

'The time has now arrived when by natural develop- 'ment standardization should extend beyond the confines 'of individual Armies, and one system should become 'general for the whole of the British Armies in the field. 'The desirability of further standardization is shown in 'recent operations on the Fourth Army front when a con- 'centration of batteries collected from all parts of the 'fighting line introduced, as far as the artillery were con- 'cerned, a large number of different systems, all of which 'had to be unlearned before serious and successful work 'could commence. The case would, of course, have been 'exactly the same had the concentration been of Flying 'Corps squadrons instead of batteries. It is not intended 'to suggest that the standard system used during the past 'winter in Fourth Army is by any means the best system, 'but the contention is that the introduction of *any* 'standard system will necessarily result, and has resulted, 'in reducing complications, preventing frequent changes, 'and making co-operation very much easier for all con- 'cerned. An aerial observer should not be considered as 'being in a similar position to a ground observer in an 'observation post. In the air, the observer is surrounded 'with distractions and confused with uncertainties. He is 'thinking how he can best avoid the shells bursting around

'him, wondering whether yonder hostile machine is going 'to take an interest in him, dodging clouds and other 'machines, and is the victim of a dozen other preoccupa- 'tions. He feels very remote and cut off from the ground 'to which, indeed, he is only connected by the delicate 'thread of his wireless signals. As soon as any check or 'difficulty arises in the even course of his shoot he becomes 'a prey to doubt and uncertainty. Is the battery receiving 'his signals—is there some misunderstanding, or why have 'they stopped? He can only succeed in the face of these 'distractions if he is in the first place familiar with his 'wireless key, and if the methods employed are well under- 'stood and so simple that he can carry on almost instinc- 'tively with a minimum of thought and concentration. 'Secondly, stoppages and checks in shoots must be avoided, 'and if they occur the answer to his appeal for information 'must be prompt and clear. Rhythm enters into it. One 'should avoid introducing intervals and pauses of unequal 'length. The study of the record of any good shoot will 'show with what remarkable regularity the signals follow 'each other until the steady pulse of the shoot is brought 'up with a jerk by some temporary stoppage which throws 'the whole machinery out of gear and upsets the rhythmical 'speed for some little time . . .

'The far-reaching effects which standardization of rang- 'ing methods may have is best shown in the consideration 'of its influence on the instruction and turning out of 'observers. The amount of aerial observation work re- 'quired by a Corps during and previous to active operations 'is often beyond the powers of a Corps squadron on the 'present establishment. The difficulties of organization 'and supply of personnel and material limit the size and 'number of squadrons which can be attached to each 'Corps, and, therefore, any increase in the working value of 'a squadron must depend on extracting the full measure of 'work out of each observer. There is no room in a modern 'squadron for untrained observers, and no time to train 'them. Casualties and the strain of war flying render con- 'tinual replacement necessary, and, although each casualty 'is immediately replaced, the working value of the squadron

'still suffers a dead loss temporarily while the new man is 'learning methods of work which he cannot at present 'learn at home. This means that a squadron at present 'can never be working at full strength. There are in 'England several schools of instruction in observation for 'pilots and observers, but they are heavily handicapped by 'being unable to teach more than the elements and first 'principles of observation duties owing to: (a) the number 'of systems in use out here, and (b) the frequent changes in 'systems which make it impossible for them to keep up to 'date. Standardization, besides increasing the confidence 'of instructors, will render it possible to turn out observers 'of such efficiency that they can commence useful work 'immediately on posting to a squadron. . . . As the 'strength of the artillery and the Flying Corps increases, 'liaison must continue to weaken, and the only substitute 'for the old understanding obtained by personal contact 'is the mechanical understanding induced by observer and 'battery commander working on the same formula and 'controlled by the same hand. The high-water mark of 'mutual understanding can now only be reached by perfect 'drill, whereby the battery and the aeroplane will work in 'one piece. . . . The introduction of one method only to 'all parts of the front will result in a reduction of signals 'and a general clean up of unnecessary litter. . . .'

As a result of this memorandum a circular letter was sent to all Corps wing commanders asking for a full statement of the methods of co-operation in use. The answers received formed a basis of discussion with the artillery authorities at General Head-quarters, and, after a process of elimination, were incorporated as modifications in a revised edition of the printed pamphlet, *Co-operation of Aircraft with Artillery* (S.S.131), which was issued in December, 1917 to supersede the edition of twelve months earlier.

The same pamphlet also modified some of the principles governing the work of balloon observers. It had been found that where the balloon observer had a fair view of a target which it was desired to engage for destruction with artillery fire, the preliminary ranging could be completed with balloon observation before the arrival of the aeroplane.

The aeroplane observer could then, after satisfying himself that the ranging was accurate, proceed at once to observe for fire effect. In many instances the reverse process had been successful not only by prearrangement, but often when the aeroplane observer, through petrol-shortage, engine failure, or other cause, had been compelled to cease work. The wireless call *K.B.C.I.* ('Kite Balloon, I am returning to landing-ground') enabled the balloon observer, in a position to co-operate with the particular battery concerned, to take over and complete the shoot. Another extension of kite-balloon work for the artillery was the co-ordination of night-observation whereby bearings were taken, by widely placed balloon observers, on the flashes of active German batteries. By the various intersections thus obtained, many new gun positions had been revealed, for daylight registration or destruction, but where activity was shown to be coming from known German batteries, effective counter-fire by the British artillery could usually be brought to bear at once.

Propaganda by Air

An incident in October 1917 raised important questions about the legality of using aeroplanes for dropping propaganda pamphlets. On the 17th of October a reconnaissance and photographic patrol of Bristol Fighters of No. 11 Squadron became involved in a fight with ten enemy aircraft over Cambrai. Two of the Bristols were shot down, and the enemy discovered in one of them, piloted by Second Lieutenant E. Scholtz with Second Lieutenant H. C. Wookey as his observer, military propaganda documents, printed in German, descriptive of the happy lot of a German prisoner in British hands and designed to create a 'will to desert'. The two officers were taken to the German Second Army head-quarters at Le Cateau and there informed that the German Government had notified the Allies in April 1917 that the dropping of pamphlets was considered illegal and that airmen found guilty of the practice would be liable to the death penalty.

The officers were tried by a German Court Martial on

the 1st of December 1917. The prosecutor asked for the death penalty for Second Lieutenant Wookey and for ten years' hard labour for Second Lieutenant Scholtz. The officers were found guilty, and each sentenced to ten years' penal servitude, the sentences being announced by German wireless on the 27th of January 1918 when it was stated that they had been passed 'on account of dropping 'enemy proclamations, in accordance with orders issued 'based on para. 58, sub. para. 9 and with para. 160 of the *Militärstrafgesetzbuch* [Manual of Military Law].¹

The British Government, on the 4th of February 1918, telegraphed to the British Minister at the Hague, for communication to the German Government, a strong protest saying: 'His Majesty's Government do not regard 'such action as contrary to international law and no 'justification has been produced by the German Govern- 'ment in support of their contention that such action is 'outside the scope of the laws of war. Similar action has 'moreover been frequently taken by German airmen on 'the various fronts, and His Majesty's Government are in 'possession of a number of inflammatory pamphlets which 'have been so distributed. Failing the release of these two 'officers, His Majesty's Government give notice (in ac- 'cordance with paragraph 20 of the Hague Agreement as 'modified by Foreign Office memorandum of October 9th) 'that reprisals will be taken at the expiration of one month 'from the date on which this notice is communicated to 'the German Government.'

Before we consider the outcome of the Scholtz-Wookey case, it will be useful to trace briefly the development of pamphlet-dropping from aeroplanes. It was begun in August 1914 by both the French and German air services and was continued intermittently throughout the war on

¹ Para. 58 read: 'He will be punished with death for treason who, with 'the intention to give aid to a foreign power or to prejudice the German or 'Allied troops . . .'—and Sub. para. 9: 'Spreads hostile appeals or proclama- 'tions in the Army.'

Para. 160 said: 'A foreigner or German who makes himself guilty of one 'of the Acts mentioned in paragraphs 57-59 and 134 during a war against 'the German Empire, will be punished in accordance with the sentences 'mentioned in these paragraphs.'

all fronts.¹ A notable instance occurred in November 1914 when proclamations, inciting Indian troops in France to rise against the British, were showered from a German aeroplane which was afterwards brought down and captured. Propaganda leaflets were first dropped by the Royal Flying Corps in October 1914. They had been prepared by Lieutenant-Colonel E. D. Swinton, the official 'Eye-Witness' at British General Head-quarters, and had been printed by the Paris *Daily Mail*. Lieutenant-Colonel Swinton, however, could not find any one at head-quarters to share his belief in the value of propaganda and nothing further was done until the beginning of 1916 when Major-General G. M. W. Macdonogh became Director of Military Intelligence at the War Office and set up a propaganda branch in his department. In the spring of 1916 a sub-section of the branch began the preparation of leaflets, written in German, for distribution among enemy troops, and the Royal Flying Corps was called upon to drop them over the enemy lines. There was also produced a news-sheet, the *Voix du Pays* (and later, *Le Courier de l'Air*), written in French and addressed to the inhabitants of occupied territory, giving them news of the progress of the war from the Allied point of view. As bundles of propaganda pamphlets were received in France they were carried over the lines, whenever convenient, in aeroplanes engaged on routine duties: no special flights for the purpose of dropping leaflets were permitted.

So long as the German command was unperturbed by the effect of the propaganda, the question of the legality of using aircraft for its distribution seems not to have been raised. But in the spring of 1917 there was a change of temper, and it must be assumed that this change came about because it was recognized that the propaganda was beginning to have some effect on the morale of the German troops.

On the 26th of April 1917 two F.E.2b's of No. 22 Squadron, of an escorted bombing formation, were shot down and their officers made prisoners. From each of

¹ Many instances are quoted in *Air Power and War Rights*, by J. M. Spaight, Ch. XIII.

these aeroplanes leaflets, addressed to German soldiers, had been dropped. No intimation was given that action would be taken against these officers, but on the 6th of June the British Government received, through the Swiss Minister, a copy of a German Foreign Office note of the 22nd of May which stated that Allied airmen on the Western front had recently dropped 'inflammatory writings, some in particular directed against His Majesty 'the German Emperor', that such acts were, in the opinion of the German Government, outside the scope of acts of war, and that instructions had been issued that airmen on whom such writings were found, or who had been guilty of scattering them, would be tried by Court Martial.

No protest against this statement of the German intentions appears to have been made by the British Government. Then in October 1917 a report was received from the Netherland Legation (British Section) in Berlin, of the trial by Court Martial, on the 17th of October 1917, of the four officers of No. 22 Squadron for 'having in April '1917 distributed (by dropping them from aeroplanes) 'pamphlets, which contained insults against the German 'Army and Government, amongst the German Army 'fighting in the Western theatre of war'. The report showed that the accused officers had been prosecuted under the paragraphs of the *Militärstrafgesetzbuch* already quoted, but although the prosecuting counsel argued that they had committed a breach of international law, he stated that the fact that the accused belonged to a hostile armed power should be taken into account in mitigation of their offence, and he asked for a sentence of ten years' penal servitude, the minimum penalty for their offence. The charges against two of the officers were found not proven and the officers were accordingly acquitted. Against the other two the Court found there was a *prima facie* case, but was not satisfied that the act committed was against international law. Even allowing that to be so, the Court was of the opinion that the accused officers were unaware of the illegality of their action in the eyes of international law and that they must, therefore, also be acquitted. At the

end of the pleading, the presiding judge read out a declaration from the German High Command to the effect that the dropping of inflammatory pamphlets was regarded by the German authorities as being contrary to international law and that this view had been made known to the Allied powers.

It was on the day these officers were tried and acquitted that Second Lieutenants Scholtz and Wookey were shot down, and it is clear that the German High Command was anxious to take full advantage of this further opportunity to get a legal pronouncement in condemnation of pamphlet dropping. But, we have seen, the British Government lodged a protest and threatened reprisals. The German Government countered with allegations that two German flying officers had been tried and condemned to death for the same type of offence in March 1915, and that France had announced her intention to try by Court Martial any captured German airmen who had dropped leaflets. The sentences on Scholtz and Wookey, therefore, were by way of reprisal. The British reply, sent on the 2nd of March 1918, showed these allegations to be unfounded. On the 9th of March the German Government said that the Scholtz-Wookey case was under consideration and presumed that the reprisals threatened by the British Government would not be promptly carried into effect, but that the reply of the German Army administration would be awaited. Two days later a telegram from the Hague announced that Scholtz and Wookey had been released from prison and sent to a prisoners-of-war camp, although the sentence passed on them could not be altered. The British reply stated that 'as Scholtz and Wookey are to be released our 'reprisals will be suspended. It should, however, be made 'clear that His Majesty's Government in no way admit 'that the alleged action for which these officers were condemned is one that justifies any sentence and consequently 'any pardon'.

Meanwhile, it was learned that four other members of the Royal Flying Corps, brought down in November and December 1917, were in prison awaiting trial on charges similar to those made against Scholtz and Wookey. On the

21st of March 1918, therefore, a demand was sent to Berlin, through the Netherland Minister, for an assurance from the German Government that the Flying Corps officers awaiting trial, as well as Second Lieutenants Scholtz and Wookey, had been released from prison and sent to a camp befitting prisoners of war, and that there would be no further proceedings against them: if these demands were not conceded reprisals were again threatened. On the 19th of April the British Government were informed that the four officers had been tried and acquitted.

In a note dated the 30th of April the German Government suggested that the British Government should expressly forbid their airmen to carry or distribute provocative literature, and stated that the German Government would, in their turn, reaffirm the existing prohibition of any such acts by German airmen. If this was agreed to, steps would be taken to get a free pardon for Second Lieutenants Scholtz and Wookey. The British Government, in reply, repeated their refusal to recognize the legality of the German view.

The legal debate continued throughout the greater part of 1918, but, although the British Government did not modify their views, the German action in sentencing Second Lieutenants Scholtz and Wookey was, in fact, effective. Immediately the trial and sentences were announced, the Chief of the General Staff in France ruled that there was to be no distribution of propaganda literature from aeroplanes under any circumstances whatever; that all future distribution must be made by balloon. Cards were printed, to be carried in British aeroplanes on the Western front, as follows: 'No printed or written matter for air distribution is to be carried in this machine. H. A. Lawrence, Lieutenant-General, Chief of the General Staff, British Armies in France.'

There is no record that the Government were informed of this action in the field which was not consistent with the uncompromising attitude which they maintained in their various communications to the German Government. It might be argued, with reason, that the printed card, carried by the flying officers, constituted a tacit admission

that the German point of view had some basis in international law, and it may therefore be assumed that had the British Government known of the order under which the cards were carried, they would have called for its cancellation. They could not, in truth, have acted otherwise.

The Government kept the question alive, by protest to the German authorities from time to time, but it was not until towards the end of the war that it was settled. The Government were notified by telegram from The Hague, on the 23rd of October 1918, that the German Government had withdrawn the order that airmen captured with inflammatory pamphlets in their possession must be brought to trial. Meanwhile, on the 14th of October, Major-General J. M. Salmond, in reply to an Air Ministry inquiry, had stated that, if it was considered necessary, propaganda literature could be dropped from aircraft without loss of efficiency, but suggested that, as the enemy was then in full retreat, and 'in an extremely tractable state of mind, 'it will be a great deal more efficacious to concentrate our 'efforts on killing him than on educating him'.¹ Eventually the Air Ministry decided that the Royal Air Force should undertake the dropping of propaganda literature and this decision was conveyed to Head-quarters, Royal Air Force, in France on the 10th of November 1918. To sum up, it may be stated definitely that the practice established in the war 1914-18, by the Central Powers as well as by the Allies, leaves no doubt that the dissemination of propaganda by aeroplanes is a legitimate act of war.

During the time when the carrying of inflammatory literature in British aeroplanes was banned by G.H.Q., that

¹ Cf. Hindenburg on propaganda (*Out of My Life*, p. 314): 'The enemy intensified the process of demoralization, not only by his blockade and the semi-starvation it involved, but, by another method, known as "Propaganda in the Enemy's Camp". This was a new weapon or rather a weapon which had never been employed on such a scale and so ruthlessly in the past. . . . It is the result of the adversary's conviction that he is no longer strong enough to defeat his enemy in open and honourable fight and conquer his moral resolution merely by the victory of his triumphant sword.'

is, from February 1918 to November 1918, great use was made of special balloons made of doped paper and manufactured at the rate of 2,000 a week.¹ The load was 500-1,000 leaflets which were released in batches by a fuse-burning device. Cotton-wick, which burned evenly at the rate of five minutes to the inch, was threaded to a wire attached to the neck of the balloon. The load of leaflets was strung in small packets by cotton threads along the length of the fuse, which was lighted as the balloon set off. As the fuse burned the packets of literature were successively released, and, incidentally, had the effect of a discharge of ballast to counteract the loss of gas from the balloon. The prevailing westerly winds of northern France—so much a drawback to the British aeroplanes—supplied almost continuously favourable conditions for the launching of the propaganda balloons. The length of their track varied with the strength of the wind, but, in general, the leaflets were scattered over an area from ten to fifty miles behind the German front-line trenches.

¹ See *Secrets of Crewe House*, by Sir Campbell Stuart, K.B.E., pp. 55-60.

BATTLE OF CAMBRAI.

20th NOVEMBER — 7th DECEMBER, 1917.



CHAPTER VI

THE BATTLE OF CAMBRAI

20th November–7th December 1917

[Maps, facing, and p. 244]

THE battle of Cambrai achieved little, yet it was one of the most remarkable operations of the war, one which threatened disaster first to one side and then to the other. It has this in common with the Second Battle of Ypres, that a new weapon of war and surprise tactics led to an initial success greater than the high command had expected. At Ypres the German gas attack opened a way to the Channel ports, but the attack had been planned by the enemy as a minor operation and, through lack of foresight and preparation, he was unable to exploit a situation of tremendous possibilities. At Cambrai the surprise tactics of omission of artillery preparation, and the employment of tanks for the first time as a major weapon of attack, created such confusion as to seem to threaten the German armies with catastrophe. The operation, however, had been planned on a limited scale. The initial success, great as it was, fell short of what was necessary to allow of progressive exploitation, but the bulge it created in the German line offered the enemy a tempting opportunity, of which he was quick to take advantage, for a spectacular counter-offensive.

The long and costly battles of Ypres in 1917 had taxed the strength of the British armies, and Sir Douglas Haig could not consider another major offensive. But there were many reasons which prompted him to sanction just such a plan as was put into operation at Cambrai. The Flanders offensive and other attacks elsewhere by the Allies had compelled the enemy to reduce the garrisons in the quieter sectors of the line. A surprise operation on one of these weakened sectors, made before the German concentrations in Flanders had been broken up and redistributed, might be expected to yield an important local success which would carry the lesson that to weaken any part of the line was to incur grave risks. Furthermore,

another attack, immediately following the Flanders offensive, would tend to create a feeling of uncertainty and so make the enemy uneasy throughout the winter. He would realize the danger of withdrawing too many troops to back areas for rest and training. The blow must be struck quickly because no similarly favourable opportunity might occur again for many months. Already large German forces had been brought across to the Western front from Russia, and it was certain that the westward flow would increase through the winter. Finally, the desperate plight of the Italian armies added force to the argument for an immediate diversion in France.

The nature and area of the attack was conditioned, in great measure, by the forceful enthusiasm of the Tank Corps. The most suitable ground in the British area for tank operations was the open undulating country in front of Cambrai, held by General the Hon. Sir Julian H. G. Byng's Third Army, and plans for the attack were worked out by the Third Army Commander and his staff in co-operation with Brigadier-General H. J. Elles of the Tank Corps. The plans received Sir Douglas Haig's sanction towards the end of October. They were of a novel kind. There was to be no preliminary bombardment and no painstaking registration of the German batteries and other positions. 'Zero' hour would come unheralded with the tanks going over the top ahead of the infantry to cut lanes through the enemy wire, to crush machine-gun opposition, and to create general alarm. Only when the advance began was the British artillery to come into action with a sudden overwhelming crash.

The front of attack extended roughly six miles between Gonnellieu and Havrincourt, and the object was to break through all the enemy defences in one day and, if this were accomplished, to pass the cavalry through to raid the German lines of communication. If, after breaking through, Bourlon Wood could be seized and a strong flank established towards Cambrai, the way was open for a general northward movement to roll up the German defences south of the Sensée river. Sir Douglas Haig arranged with the French Commander-in-Chief for a

strong French force of infantry and cavalry to be in readiness, if the event should turn out as planned, to go through the gap and swing away to the right in rear of the German defences.

The German defence system which was to be breached was formidable, and comprised three main sections. The first, constituting part of the Hindenburg Line, was a length of six miles between the Canal de l'Escaut at Banteux and Havrincourt. About a mile behind this was the so-called Hindenburg Support Line, while farther east again, at an average distance of four miles, was the third system known as the Beaurevoir-Masnières-Marcoing Line. The whole system was further strengthened by a series of forward positions, in advance of the Hindenburg Line, including la Vacquerie and a corner of Havrincourt Wood. The trenches of the Hindenburg Line were specially wide, in some places wide enough to swallow the Mark IV tank.

It was calculated that if the operation was kept secret to the last moment, no considerable German reinforcements could reach the front until forty-eight hours had elapsed from the opening of the attack. In other words, Sir Douglas Haig would have two days in which to carry the German positions and establish himself on the dominating Bourlon ridge, and to secure his right flank. Thereafter it would require time to exploit the situation, but if the cavalry got through to cut communications and hamper the bringing forward of troops, the prospects of gaining the necessary time seemed reasonable.

It will be observed that the Commander-in-Chief's outline of his expectations is in conflict with his declaration that the attack was a limited one which aimed only at a local success. The possibilities were, in fact, inherent in the original plans, but the troops were not available, nor were the preparations adequate, for an operation on such a scale. As will be told the initial expectations were not quite realized, but had they been, and had the more ambitious project been put in hand, the incalculable chances of war would again have had play. They would have brought the enemy, no less than the Allies, scope for a blow of some magnitude.

The air co-operation in the battle involved not only the squadrons of the III Brigade attached to the Third Army, but also part of the fighting and bombing strength of the I Brigade¹ and the bombing and reconnaissance squadrons of the head-quarters Ninth Wing. The I Brigade was to bomb Somain and Dechy railway stations, maintain offensive patrols between Douai and the Sensée river, make low-flying attacks on suitable ground targets as far east as the line Somain-Denain, and to be responsible for continuous reconnaissance of rail and road movements, from 10 a.m. to dark, of the area north of the Sensée river as far east as Denain. Twelve Corps aeroplanes of the Brigade were to be kept ready for bombing and machine-gun attacks if considerable enemy movements were reported. The Ninth Wing squadrons were to bomb Busigny, Valenciennes, Denain, and Douai railway stations, and keep observation for movements in the area south of the Sensée river, eastwards of Cambrai, and southwards again to the Masnières-Marcoing bridges. During the night following the opening of the battle, Douai and Somain stations were to be bombed.²

The III Brigade, reinforced for the battle, comprised six Corps squadrons, seven fighter squadrons, one fighter-reconnaissance squadron, and part of a day-bombing squadron (two D.H.4 Flights of No. 49 Squadron which had arrived from England on the 12th of November 1917). These squadrons, on the eve of the battle, possessed a total of 289 aeroplanes,³ whereas the whole German Second Army, whose right flank only was in the Cambrai

¹ A General Head-quarter's instruction to the First Army commander stated that the fighting and bombing squadrons of the I Brigade would be drawn on by General Head-quarters to reinforce the battle-front. As the missions they would be required to make would depend on the progress of the battle, authority, it was stated, would be delegated by General Head-quarters to the G.O.C. Royal Flying Corps to issue orders to the I Brigade direct. This procedure was put in force at 4 p.m. on the 19th November and ended on the evening of the 25th.

² For the scheme of co-operation of the I Brigade and Ninth Wing, see Appendix IX.

³ One hundred and twenty-five for Corps work, 134 single-seater fighters, eighteen Bristol Fighters, and twelve D.H.4's. See Order of Battle, Appendix X.

sector, could count upon no more than seventy-eight aeroplanes of which twelve were fighters. Thus, at the opening of the battle, the III Brigade alone outnumbered the opposing enemy air service by about four to one generally, and, in fighting aircraft, by ten to one. The addition of the Ninth Wing squadrons and the part of the I Brigade involved, makes the initial air concentration truly overwhelming. The kite balloons, of which six sections were available for work with the various Corps of the Third Army, were to be specially used for reporting movements of German troops to the artillery.

As there was no preliminary registration or bombardment of German targets, arrangements of a special kind had to be made for air co-operation on the day of the attack.¹ There would be no time for the deliberate observation of fire of the British artillery. What was essential was that the positions of active German batteries should be comprehensively notified and that, to save time, air observation should be confined to general corrections of fire for neutralization. Equally important was the prompt reporting to the gunners of concentrations of hostile troops. To supplement the effect of the artillery fire four fighting squadrons were set aside for attacks, with bombs and machine-guns, against ground targets, notably active batteries, machine-gun emplacements, and troops. There were to be low-flying attacks also by four Sopwith 'Camels' on each of six aerodromes. To facilitate the work of these fighting squadrons a forward aerodrome was organized at Bapaume and plentifully stocked with petrol, ammunition, bombs, and spare parts. The attacks by fighters on German batteries were not to be haphazard. By long and careful observation, lists had been compiled of the known German guns expected to be most troublesome. These were divided into three groups, and systematic attacks by the fighting pilots were planned against each group. The attacks on troops and transport were to begin forty-five minutes after the infantry assault, and for an hour and a quarter were to be made along an extended front from Fontaine-lez-Croisilles

¹ The Operation Order of the III Brigade is given as Appendix XI. This should be studied with the tactical map, p. 244.

to Bellicourt with the object of deceiving the enemy about the main point of attack. Thereafter the low-flying fighters were to concentrate on the main battle front and were to give special attention to the lines of approach of the German resting battalions, as indicated on tactical maps issued to the pilots.

As secrecy was the essence of the whole operation, it was absolutely necessary to deny the enemy any view of the concentrations for the battle, especially of the tanks. All major movements were made under cover of darkness and elaborate precautions were taken for the daylight concealment of concentrations in back areas. The forest of Havrincourt in particular offered cover for great numbers of tanks and troops. Nevertheless, daylight reconnaissance by enemy aeroplane observers must have led, at least, to the arousing of suspicion. A series of discreet and unobtrusive fighter patrols was therefore arranged, chiefly to cover the area of the British lines.¹

In the event this precaution was unnecessary. The weather for once favoured the British plans, and the November days of mist and low cloud made air observation almost impossible.² The surprise indeed was not complete, but it was effective enough. On the eve of the battle the questioning of British prisoners led the enemy to expect an attack on the following morning, but he had little idea of its nature, nor was there time to do more than warn the troops actually in position. The officer commanding the only German fighter Flight on this front (*Jagdstaffel 5* at Estourmel) tells how the telephone at his bedside rang at 11 p.m. on the 19th of November.³ He was told that the British were expected to make a big attack next morning west of Cambrai and he was ordered to be

¹ Occasional distant sweeps were also made by large formations of Bristol Fighters, Sopwith 'Pups' and D.H.5's, disposed in stepped layers, the 'Pups' about 15,000 feet, the Bristols 3,000 feet lower, and the D.H.5's 3,000 feet lower again. The formations were planned so that each type of aeroplane was used at the altitude to which it was best suited with each type complementary to the other.

² 'The preparations for the English offensive at Cambrai completely 'escaped the notice of the air service.' (Hoepfner, *Deutschlands Krieg in der Luft*, p. 123.)

³ Neumann, *In der Luft unbesiegt*, pp. 96-100.

ready to take the air from 7 a.m. onwards. He was not unduly disturbed. He had often been similarly warned before and nothing had happened, nor, if the attack came, was there much prospect of flying. For a fortnight his aeroplanes had not left their sheds and the weather promised no early improvement. So with quiet mind he went to sleep again.

He was awakened, while it was still dark, by the rattling 20 Nov. of his window panes and by the crash of artillery. His officers and men assembled in excitement on the landing-ground, but dawn brought a grey haze and a drizzle of rain. To fly, he decided, would be madness. The telephone went continuously telling him of British tanks and aeroplanes swarming over the front. Soon came a summons to the telephone from the Chief of Staff of the Army Corps, who demanded: 'Why are you not flying?' 'I endeavoured to explain', records the flying officer, 'that, at the moment, it was impossible to reach the front; immediately after the start we would get into dense fog, the pilots would get lost, and the aeroplanes of the only fighter Flight of the Army would be damaged in making forced landings. My views were not accepted. English aircraft were over the front and I was to start at once. I was even threatened with Court Martial. But what cannot be done, cannot be done. . . .'

Half an hour later the twelve German pilots were sitting in their aeroplanes ready to take the air when anti-aircraft fire warned them of the approach of British aeroplanes. As these appeared from out of the mist, two of the German fighters left the ground. The Royal Flying Corps raiders were three of nine 'Camel' pilots of No. 3 Squadron¹ who had set out to attack the German aerodromes. They dropped their bombs on the landing-ground and fired their machine-guns, but without apparent material effect: one of them was shot down by one of the two German fighters which had left the ground on the approach of the 'Camels'; the other two, on the homeward journey, collided with trees in the mist and were killed. 'Not

¹ No. 3 Squadron, formerly a Corps squadron, had been re-equipped as an Army squadron on the 6th of October 1917.

20 Nov. 'without justice', says the German flying officer, 'did the 'Chaplain express an enemy's admiration for the dead 'flyers.' The six remaining 'Camels' of No. 3 Squadron attacked their allotted objectives—the aerodromes at Carnières and Caudry, the pilots dropping their 25-lb. bombs from 100 feet or under. One of these 'Camels' failed to return and another was so much shot about that it had to be rebuilt. Eleven Sopwith 'Pups' of No. 46 Squadron set out for the aerodromes at Awoingt, Provville, and Avesnes-le-Sec, but, owing to the mist, only the first-named objective was found and on this eleven 25-lb. bombs were dropped.

The mist, which made difficult the way of the aeroplane pilots, helped the advancing tanks and infantry. At ten minutes past six, on the morning of November the 20th, the long line of tanks, with the infantry close at hand, had left their assembly positions and, ten minutes later, under cover of artillery, smoke, and machine-gun barrages, and with aeroplanes overhead, had moved forward to the Hindenburg Line. As the tanks loomed upon them, crushing lanes through the wire—nowhere less than fifty yards deep—the German troops were seized with panic. The outer defences and the Hindenburg Line were rapidly overrun and the tanks and infantry moved slowly forward, according to programme, to the next line of defence. By 10.30 a.m. this line had fallen, except at Flesquières and Lateau Wood, and the infantry, with cavalry in support, were advancing through open country towards their final objectives.

Lateau Wood, which offered cover to many German batteries, was taken in the morning after bitter fighting, but Flesquières village, although the British troops passed on either flank far to rearward of the position, remained uncaptured throughout the day. The tanks at Flesquières came under fire, at short range, from field guns beyond the crest of the hill and suffered heavy casualties. These guns had been pulled out of their pits and had been placed in the open. With the tanks out of action, the infantry, who had been following too far behind, were firmly held by uncut wire and by machine-guns.¹ By the late afternoon

¹ 'As the tanks topped the crest they came under direct artillery fire at

the final German line, covering Cambrai, had been *20 Nov.* breached, but it was judged too dark to allow the cavalry to pass through, nor had the vital Bourlon ridge been captured, and both these disappointments were chiefly due to the check at Flesquières.

A second check, which also had wide effects, was at Masnières, where the bridge over the canal de l'Escaut, although not destroyed by the enemy, had been so weakened that it collapsed under the first tank that tried to cross, with the result that tanks could not go forward to help in the attack on part of the enemy's third and final line of defence. Nor was the way open for the passage of the cavalry who might otherwise have pushed on to Cambrai, for there was little to prevent them at that time. A temporary bridge was, after vital delay, built south of Masnières and a squadron of Canadian cavalry crossed and did good work until most of the horses were killed or wounded, but this brief action was no more than a brilliant local skirmish.

It has already been told that the fighting pilots of the Royal Flying Corps had been given, among other objectives, three separate groups of German batteries which they were to attack with bombs and machine-guns. From these groups most trouble had been expected, and how well-founded were these expectations is clear from the fact that one group set down for Flying Corps attention was at Flesquières and another at Lateau Wood. The third group was at Vaucelles Wood. Four D.H.5's of No. 64 Squadron¹ arrived over Flesquières at 7 a.m. and found the German batteries fully active, the guns being still in their pits. The pilots bombed the gun-pits, with

'short range and suffered heavy casualties. This loss would have mattered 'little had the infantry been close up, but, being some distance off, directly 'the tanks were knocked out, the German machine-gunners, ensconced 'among the ruins of the houses, came to life and delayed their advance until 'nightfall.' *Tanks in the Great War*, by Brevet-Colonel J. F. C. Fuller, p. 149.

¹ No. 64 (D.H.5) Squadron had arrived in France on the 14th of October 1917. The pilots had been practised in England in low-flying across country. On arrival in France this low-flying practice was continued in formation.

20 Nov. their 25-lb. bombs, scoring at least one direct hit, and expended their ammunition against the gun-detachments. One group of gunners, who ran for shelter to a house, got jammed in the doorway and, immovable, were riddled by the bullets of the leader of the D.H.5's. One of the pilots had a stoppage in his machine-gun and had flown some distance eastwards before he had rectified the stoppage. He turned back towards Flesquières, but when he came over the German battery positions again at 7.45 a.m. he could find no activity of guns or personnel. Several corpses of men were lying near the pits, and dead horses and a limber were on the road. It is possible that in the interim the guns had been pulled out and that the earlier low-flying attacks had caused or accelerated this precaution. The guns could be more easily dealt with in their known pits, which were in fact marked targets for the British artillery, than in unknown open positions, mist obscured, on the reverse slope of the crest. While these attacks were being made on the Flesquières batteries, nine Sopwith 'Camel' pilots of Nos. 3 and 46 Squadrons were making similar attacks on the batteries in Lateau and Vaucelles Woods.

Writing after the war, Squadron Leader A. S. G. Lee, who was one of the 'Camel' pilots of No. 46 Squadron in the Cambrai attack, said: 'On the morning of the 20th we 'started, on the first faint flush of light, for our objectives, 'which ranged from selected batteries and other targets in 'the forward area to aerodromes and other objectives 'farther behind. Low clouds and misty weather made 'flying difficult, but on the whole were not unfavourable to 'the work. In the battle area the smoke rose to the mist 'and formed a barrier not very pleasant to penetrate at so 'low an altitude. A few casualties occurred through pilots 'flying into the ground, but the majority were from ground 'fire. Those of us who survived did so, I consider, because 'we flew very close to the ground until our objective was 'reached. I recollect, on our first "show" on the morning 'of the 20th, having to rise to pass over tanks moving 'through the thick haze of smoke towards the German 'defences. One retains vivid pictures of little groups of

'infantry behind each tank, trudging forward with cigarettes alight, of flames leaping from disabled tanks with small helpless groups of infantry standing around, of the ludicrous expressions of amazement on the upturned faces of German troops as we passed a few feet above their trenches. We reached and passed them before they had time to locate our direction of approach. As soon as the objective was reached it became necessary to rise in order to attack, and then of course one's risks from ground fire became normal. Owing to the low clouds it was not easy to retain one's bearings especially after a few startled turns to avoid collision with one's companions. Actually, on this first task we became separated and I lost my way; after flying by compass towards what I thought was the west, and passing over what appeared to be a slice of the battle, I landed in a field to discover my bearings and found I was some miles east of Cambrai. The road nearby was full of German troops and I had to make a hurried take-off . . .'

Throughout the remainder of the day no further special attention seems to have been given to the Flesquières area by fighting aircraft. The pilots of the Nos. 3 and 46 Squadrons, as of the other fighting squadrons, returned time and again to the advanced landing-ground, reloaded with bombs, petrol, and ammunition, and disappeared into the mist to spread their attacks over German troops, transport, and other targets of a general nature. This was in accordance with the original operation orders which specified that forty-five minutes after the infantry assault, the low-flying attacks were to be general.¹ The officer commanding No. 64 Squadron, Major B. E. Smythies, has recorded that among his impressions, noted while the battle was in progress, was that the squadron commander in an Army Wing had very little idea of what was happening on the ground. 'He can', he said, 'ascertain roughly where the line is and what attacks are in progress over a limited front, but the ground tactics, proposed counter-attacks, and subsequent objectives are almost a sealed book. He is in any case very fully occupied with other things. The

¹ See Para. 2c, Appendix XI.

20 Nov. 'flying officer neither knows nor cares more than is of 'interest to him to carry out his specific object.'

It should be remembered that the fighting pilot was concerned chiefly with fighting other aircraft, and he was seldom qualified to appreciate the tactical flow of a battle. It is not difficult to look back and isolate the great importance of the hold-up at Flesquières, but, in the misty and smoke-obscured confusion of the battle, the significance of that check might easily be missed. Even had the fighting pilots known of it and realized its importance, it would be idle to claim that their attacks could have been made powerful enough to wipe out the German resistance. All they could be expected to do, especially in the circumstances of the weather, was to harass the enemy and sap his morale. They might have put a gun here and there out of action. All this would have made easier the task of the tanks and infantry, but so long as the German guns remained intact and the gun-detachments determined, the power for resistance was little impaired. The truth is, and the reason is not far to seek, that low-flying attacks were more effective against infantry than against batteries. Bullets, and even light-weight bombs, could not, except by chance, do much harm to a gun. Furthermore, the target was small and the detachment usually had some measure of shelter. But that infantry feel their helplessness in face of attack from the air there is ample evidence. Psychology enters into it. The gun-detachment probably feel that what matters is the gun. That is the chief target for attack, while they themselves are subsidiary, and if one or two of them become casualties, there will still be some one to serve the guns. The infantryman, however, cannot shield himself behind any such reasoning. If an aeroplane dives at him he has no doubt that he is the target. Any one who has suffered such attacks will bear witness to an impression of magnified isolation. The man attacked has the feeling that he stands out clear cut and as obvious to the pilot in the aeroplane as the aeroplane itself is to him. This feeling is not lessened if he is one of a group. Rather is it enhanced because it means that the target, of which he is the centre, is more sharply defined.

Through most of the morning the D.H.5's of No. 64^{20 Nov.} Squadron and of No. 68 (Australian) Squadron,¹ and 'Camels' of No. 46 Squadron kept diving out of the mist to attack troops and transport, and their activities, as is clear from prisoners' statements and other evidence, extended the panic created by the tanks. The casualties among the low-flying aircraft were high: nine of them failed to return, four were wrecked, and thirteen were so badly damaged by fire from the ground or in accidents due to the mist that they had to be sent to the depot for reconstruction. These casualties represented 35 per cent. of the aeroplanes used on this type of duty.²

The original orders given to the low-flying fighting pilots had directed special attention to the enemy batteries at Flesquières, but the artillery aircraft observers were not told to keep particular watch on any one section of their Corps fronts. Their general orders were to concentrate their attention on finding and reporting active hostile batteries and bodies of troops, but they had been instructed also to keep a look-out for any guns, in the forward areas, in use as 'anti-tank' weapons. It is a fact that the air observation for the artillery failed. There is no record of a single active German gun being reported, along the actual battle-front, either by the aeroplane observers, or by any other source. The German artillery on this front was admittedly weak and, after the advance began, many guns were captured or hurriedly withdrawn. There was not, therefore, much firing. Furthermore, unless an aeroplane happened to be immediately over or near a gun at

¹ Three Australian Squadrons served in France. Originally numbered 68, 69, and 71 Squadrons of the Royal Flying Corps, they became, in January 1918, Nos. 2, 3, and 4 Squadrons of the Australian Flying Corps. They will find frequent mention in this history, but their story is told in detail in *The Australian Flying Corps*, by F. M. Cutlack, which is Volume VIII of the Official History of Australia in the War of 1914-18.

² The losses in low-flying aircraft averaged 30 per cent. on the days when they were employed for organized attacks throughout the battle. It was difficult, at this time, to replace the pilot casualties owing to the special nature of the work which called for considerable skill and experience. There had not, at that time, been much opportunity to give selected pilots the necessary training in low-flying.

20 Nov. the exact moment when it fired, the air observer had small chance of seeing the flash. What was happening a few hundred feet away from the aeroplane was completely obscured by the mist. The contact-patrol observers, in various parts of the battle-field, reported the progress of the infantry, but the position at Flesquières was never made clear to the various staffs behind the front. Had it been properly realized, an immediate artillery concentration would have been ordered.¹ The German batteries could have been overcome, fresh tanks could have been sent forward, and the wire could have been cut, but the staff for a long time acted under the impression that Flesquières had fallen. A pilot who had passed low over the village at 10.15 a.m. had seen troops marching east and, apparently deceived by the poor visibility, had thought they were British. His report led the staff to believe the position had been captured and this information seemed to be confirmed by subsequent messages from the 51st Division that they had got the whole of Flesquières and that the way was open for the cavalry.² The cavalry was ordered to go through, but reported at noon that the infantry were still fighting desperately at Flesquières. When the 51st Divisional staff realized what the position at Flesquières was, tanks were collected and sent forward and plans were hurriedly made for a comprehensive attack to outflank the village and ridge, but the light failed before this operation could be begun. Meanwhile, a further series of direct attacks, made in the late afternoon with the help of six tanks, proved abortive. About 3 p.m. rain had set in and the conditions were such that aircraft co-operation was impossible.

Many of the bombing attacks, as ordered for the headquarters Ninth Wing squadrons against distant enemy communications, were attempted, but, except for two

¹ Artillery orders allowed for 'concentration of all available guns and 'howitzers, field, heavy and siege, for five to ten minutes, on any hostile 'battery reported active.'

² The G.O.C. 51st Division reported by telephone about 11 a.m. to IV Corps head-quarters that Flesquières was in our possession and that the road from Trescault to Flesquières was fit for cavalry.

bombs on Brebières station, south-west of Douai, were foiled by the mist. Nor could the squadrons of the I Brigade, which were to co-operate north of the Sensée river, fulfil their duties. There was no flying in the morning, but at 1.30 p.m., when the visibility improved temporarily, single-seater fighters set out to reconnoitre for enemy movements. Twelve pilots flew over the allotted areas, but saw little or no movement in progress. Other long-distant reconnaissances and bombing raids by D.H.4's were attempted, but all pilots were forced to return on account of the weather. The bombing ordered for the night of the 20th/21st had also to be abandoned.

Despite the checks already referred to, the first day had brought a remarkable success, and Sir Douglas Haig still had twenty-four hours before, according to his calculations, important reinforcements could arrive to stiffen the enemy defence. He was helped by the evacuation of Flesquières which took place during the night of the 20th/21st. At daybreak on the 21st a British patrol found the place empty and at once the advance became general. The vital point now was the lofty Bourlon Wood. Progress was steady although the enemy was showing more resistance, especially at Cantaing. This position, however, fell in the early afternoon, and later in the afternoon the important village of Fontaine-Notre Dame, astride the Bapaume road between Bourlon and Cambrai, was captured. But Bourlon Wood itself, a nest of machine-guns, held out despite the fact that a few tanks crashed their way some distance inside. Rain and low clouds again hampered the co-operating air observers, but the mist was less pronounced, and they were able, by persistent low-flying, to follow and report in some detail the movements of the infantry, tanks, and cavalry. German aircraft also made many swift low-flying attacks which greatly harassed the troops as they advanced towards Bourlon Wood.¹ The

¹ The 62nd Division reported that German low-flying aeroplanes had given 'considerable trouble' at Bourlon in the morning, and the III Brigade was asked to take action to prevent a repetition of these attacks next day. On the 22nd, therefore, four S.E.5a's were specially allotted to attack low-flying German aircraft at Bourlon.

low clouds prevented any of the bombing on the German railway junctions from being made.¹

By the evening of the 21st the forty-eight hours which must elapse before the enemy could appreciably strengthen his defences had expired, and the situation had many elements making for disquiet. It was impossible to stand still. The Bourlon ridge commanded all the newly won positions north of Flesquières, and it was imperative either to go on and capture Bourlon or else to retire, at once, and consolidate the Flesquières line. The arguments for a limited withdrawal were ponderable. A substantial tactical success had been gained and considerable numbers of prisoners and guns captured. The days of continuous marching and fighting had put a severe strain on the endurance of the troops, and they would require rest before they could be expected to make the attack on the formidable Bourlon ridge. Furthermore, the British onslaught had been so overwhelming that German counter-measures of unusual energy and decision must be anticipated. It was a matter of common sense that the alarm created by the first day's advance would induce the German High Command to rush adequate forces of first-class fighting capacity to the danger area. A withdrawal to the Flesquières line would have put the British troops in a good position to meet whatever enemy counter-measures were taken. Nor would such a withdrawal have detracted anything from the success of the battle because the main objects for which Sir Douglas Haig fought the action would still have been achieved. The enemy would have realized the danger of weakening any part of his front, he would have cause for uneasiness throughout the winter, and, as a diversion to ease the tension on the Italian front, as much had been done as it was possible to do. On the other hand, the temptation to go on was great. Possession of the Bourlon ridge would give observation over the lines of communication of the German defences south of the Scarpe and Sensée rivers and might lead the enemy to abandon these positions. Furthermore, General Head-quarters judged that the German

¹ The objectives which had been allotted for day bombing were the stations at Somain, Dechy, Douai, Denain, Busigny, and Le Cateau.

reinforcements which could arrive within a few days would do little more than suffice to replace losses. In the result, Sir Douglas Haig decided to go on.

There was quiet on the 22nd of November to rest the tired troops and to allow of reliefs being made. In the Bourlon sector, however, this quiet was interrupted by enemy counter-attacks which led to the recapture of Fontaine-Notre Dame. The weather conditions were difficult for air work, but there were reconnaissances to report the movements of German reinforcements, and to assess the probable strength of the enemy resistance on the Bourlon ridge. The air reports left no doubt that Bourlon was strongly held. Machine-gun posts, it was stated, lined the western and south-western edges of the wood, and German infantry activity in the whole area was considerable. Farther afield there was ample evidence of important movements towards Cambrai. A congestion of trains in Douai station and much southward movement from that rail-head told of reinforcements coming from the north. Columns of troops and transport were reported marching towards Cambrai along the Douai-Cambrai road, and other columns were moving south of the Lens-Douai road.

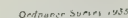
The Flying Corps pilots did not content themselves with reporting these activities. From 7 a.m. onwards relays of pilots from Nos. 3, 46, and 64 Squadrons, and from No. 68 (Australian) Squadron attacked, with light-weight bombs and machine-gun fire, the troops and gun emplacements in the area of Bourlon Wood, while the fighting pilots who reported the movements in the Douai area exhausted their ammunition against the German columns. Nineteen pilots were involved in these various low-flying attacks, and the casualties were high: at the end of the day three of the aeroplanes were missing, three others had been wrecked on the British side of the lines, and two had been so damaged that they had to be sent away to be rebuilt. These casualties were due, in part, to enemy action, but chiefly to the difficulties associated with low-flying in the mist. The presence of several German aeroplanes over the battle-field indicated that the enemy air service had been reinforced,

and low-flying attacks were made from time to time against parties of British infantry on their way to the forward area. To counter the German air activity offensive patrols were attempted by pilots of Nos. 41 (S.E.5a) and 84 (S.E.5a) Squadrons, and there were many fleeting combats, in which two enemy fighters were destroyed, and one was shot down intact within the British lines. The only S.E.5a casualty due to enemy action was one pilot wounded, but fog overtook some of the pilots, and three were killed in accidents (two by collision and the third through hitting a tree), and two were injured. The same railway objectives as for the previous day had been allotted to the day-bombing squadrons for the 22nd, but although individual pilots made many attempts, little could be done because of the low clouds. Two 112-lb. bombs were dropped on Douai station and four of the same weight on Dechy.

23 Nov. On the morning of the 23rd of November the attack on Bourlon Wood and on the village of Fontaine-Notre Dame was made. On the right, the 51st Division, with tanks in support, advanced on Fontaine, but was unable to force an entrance. In the afternoon a second attack on the village was launched, but although a number of tanks penetrated well inside and inflicted heavy casualties, the infantry were unable to clear the place, and, by nightfall, there had been no progress on this part of the front. A feature of the German defence at Fontaine was the effective use of anti-aircraft guns, mounted on lorries, as anti-tank weapons. A German authority has claimed that these guns were mainly responsible for the British failure to break through at Cambrai.¹ This is claiming too much, but that the anti-aircraft guns played an important, even vital, part in holding the British attacks at critical times, is clear. On the opening day—the 20th—a battery of light anti-aircraft lorry guns had raced out of Cambrai, when the British were reported to be approaching the town, and, it is said, put three tanks out of action. The battery had later fired, at almost point-blank range, at a squadron of cavalry which

¹ Major Grosskreutz, in an article entitled 'The Battle of the Tanks at 'Cambrai', in *Die Luftwacht*, July 1928.

20th. NOVEMBER, 1917.





attempted to occupy Cantaing. These successes led the German High Command to bring up large numbers of mobile anti-aircraft guns, and some of these were in action on the 23rd. At Fontaine they succeeded in putting five tanks out of action and thereby contributed greatly to the effectiveness of the German resistance to the attack on the village.¹ While the 51st Division was fighting at Fontaine, the 40th Division, newly arrived in the IV Corps area, attacked and captured, after four and a half hours of hard fighting, the whole of Bourlon Wood, and gained an entry into Bourlon village.

Although the visibility was only fair, the weather during the day was otherwise favourable for flying and there was great activity. The German aircraft reinforcements now included the Richthofen 'Circus' (*Jagdstaffeln*, 4, 6, 10, and 11), hurriedly brought down from Flanders. The German leader took general command of all the air fighting units which, in addition to his own, included No. 5 *Jagdstaffel*, the original fighting Flight in the area, and No. 15 *Jagdstaffel*, which had arrived on the 22nd from the German Seventh Army front in the south.

The British infantry began their attacks on the 23rd at 10.30 a.m. and, from 10 a.m. to dusk, relays of fighting aircraft from Nos. 3, 46, and 64 Squadrons, and from No. 68 (Australian) Squadron operated, in close touch with the infantry, against the German troops in Bourlon and Fontaine-Notre Dame. A total of fifty aeroplanes of these squadrons were so employed in formations varying from four to fifteen; to make repeated attacks possible, the advanced landing-ground was used for re-loading and refuelling. The low-flying pilots were plentifully supplied with targets, and they had the satisfaction, on occasion, of watching the tanks and infantry profit from the air attacks. In the morning, for example, D.H.5's of No. 68 (Australian) Squadron found the attack held up in one corner of Bourlon Wood by a German

¹ After the battle of Cambrai many anti-aircraft guns were detailed, by various minor commands, to deal solely with tanks. This meant that their proper duty was neglected, and the German High Command had to issue orders to limit the use of anti-aircraft guns as anti-tank weapons.

23 Nov. two-gun battery which had brought three tanks to a standstill. Lieutenant F. G. Huxley, one of the D.H.5 pilots, from a height of 100 feet, dropped four 25-lb. bombs and temporarily silenced the guns, so that the three tanks, with three others which came up behind them, were able to go forward again. The same officer, by repeated diving attacks on a nearby strong-point that was holding up the infantry, helped the British troops to advance and capture the position. On the left of Bourlon Wood an enemy strong-point held up part of the advance, particularly of the 10th Royal Irish Rifles, for most of the day. In the afternoon Lieutenant A. Griggs, a pilot of American birth in No. 68 (Australian) Squadron, was over the Royal Irish Rifles, and after he had reconnoitred the position, he made repeated diving attacks and, from fifty feet, fired at the German troops with his machine-guns. He was met with heavy fire and was ultimately shot down and killed, but the gratitude which his action evoked endured long after the battle had ended.¹

The British low-flying attacks on the 23rd had reached a peak of intensity about 1 p.m. when fifteen aeroplanes were over the Bourlon and Fontaine positions. It so happened that Richthofen, at the same time, was making his first patrol of the area with a formation of his fighters, and he quickly added to his list of successes. After forcing one pilot to land west of Bourlon Wood, he attacked another who was flying low over Fontaine. His first shots wounded the pilot, Lieutenant J. A. V. Boddy in a D.H.5 of No. 64 Squadron, in the head, and the aeroplane fell in a corner of the wood. Another D.H.5 pilot, meanwhile, while firing on German troops in retreat from the wood, was brought down, ahead of the British infantry, by a direct hit on his aeroplane from a shell. When he had extricated himself from the wreckage he saw Lieutenant Boddy's aeroplane crashing into the trees; he went across and rescued the

¹ The following tribute appeared in the 'In Memoriam' column of *The Times* in 1918. 'To an UNKNOWN AIRMAN, shot down 23rd November 1917, 'whilst attacking a German strong-point south-west of 'Bourlon Wood, in the effort to help out a Company of the Royal Irish 'Rifles, when other help had failed.'

pilot and the two made their way safely to a British dressing station. *23 Nov.*

The low-flying attacks were maintained until dark. By the end of the day 30 per cent. of the aeroplanes engaged on this work had been wrecked, but the verbal testimony of the tank personnel and of the infantry was that the aeroplane pilots often made advance possible when the attacking troops would otherwise have been pinned to their ground. The visibility, as has been stated, was not good and, to minimize the danger of collisions between the low-flying aeroplanes, some squadron commanders adopted the procedure of sending the individual pilots out by one route and home by another. The routes chosen made it impossible, or at least extremely unlikely, that outgoing and incoming pilots from the same aerodrome could meet.

The bombing of distant objectives was made during the day by various Corps squadrons, by No. 18 (D.H.4) Squadron of the I Brigade, and by Nos. 25 (D.H.4) and 27 (Martinsyde) Squadrons of the Ninth Wing. Thirty-six 112-lb. bombs were dropped on Dechy station by No. 18 Squadron, and twenty-four bombs of the same weight were distributed on Douai, Somain, Denain, and Dechy, by No. 25 Squadron. One pilot of No. 27 Squadron also dropped two 112-lb. bombs on Douai station. Once again air reconnaissances told of southward movements of troops and trains to and from Douai, and left no doubt that the flow of German reinforcements to the Cambrai front was in full tide. During the night of the 23rd/24th ten pilots of No. 102 Squadron were sent out to attack the stations at Douai and Dechy. The weather again proved unfavourable and only five pilots succeeded in finding their objectives on which they dropped eight 112-lb. bombs.

For the next few days the struggle at Bourlon continued. In the afternoon of the 24th of November the whole of Bourlon village was captured, but was lost again next evening as a result of strong German counter-attacks. On the 27th a further attempt was made to secure Fontaine-Notre Dame and what still remained to the enemy of the

Bourlon ridge. The village was taken, but in face of heavy counter-attacks the ground won could not be held.

The weather during these days of local fighting at Bourlon was unfavourable for flying, but there was some spasmodic bombing, and there were occasional clashes with German fighting formations. The main bombing objectives were the German railway centres, but they could seldom be reached owing to the clouds. On the 26th there was a specific attempt to bomb the crossings and traffic over the Sensée river. No. 25 Squadron bombed Aubigny-au-Bac and Neuville, and No. 27 Squadron attacked Pont Rade and the bridges between Tortequenne and Lécuse. The influence of the presence of the Richthofen 'Circus' is to be noted in the provision of strong fighter escorts for some of the bombing formations. On the 26th of November, for example, twelve D.H.4's of No. 49 Squadron, on their first attempted bombing raid on the Western front, were given an escort of fourteen S.E.5a's.¹ Another example is an increase in the strength of the reconnaissance formations. Up to the time of the arrival of the reinforcing *Jagdstaffeln* the orders for No. 11 Squadron allowed for a maximum of four Bristol Fighters for one reconnaissance, but, on the 23rd, the reconnaissance formation was increased to eight, and, on the 28th, to twelve.

The general situation on the evening of the 27th had many elements making for uneasiness. We held strong positions on the Bourlon ridge, but had not yet gained what was necessary to make the position in this important sector secure. Air reconnaissances during the day told, once again, of formidable train movements radiating southwards towards Cambrai from Lille, Douai, and Denain. For two days, while the troops were being rested and relieved, preparations were made for a final attack to capture what was still needed to make the Bourlon position secure.

During these days of quiet, however, there were many

¹ The raid was directed against the rail-head at Rieux, east of Cambrai. It was only partly successful. Eight 112-lb. bombs were dropped on Rieux and six on Sailly. The S.E.5's did not establish touch with the bombers. The raid was attempted again later in the day, but was foiled by clouds.

indications that the enemy was preparing a counter-attack. His artillery became more active, not only along the front on which the recent advance had been made, but farther south also towards and beyond Vendhuille. There were many registrations of the British positions under the direction of German wireless fitted aircraft, which, on the 29th particularly, were more active than at any time since the battle began. The troop and transport movements from the north towards Cambrai were now, it appeared from air reconnaissance and other reports, spreading out, and the indications were that the enemy troops were moving to their positions immediately behind the front. In the southern area, towards Vendhuille, some anxiety was caused by the appearance of many low-flying German aircraft, among which the coloured aeroplanes of the Richthofen 'Circus' were said to be conspicuous.

In other words, it was clear by the evening of the 29th that there might be an extensive enemy attack which would be likely to involve the front as far south as Vendhuille. While, however, the British troops in the south—weak divisions holding extended fronts—were warned to expect an attack, divisional reserves in the area were closed up, and additional machine-gun posts placed, Sir Douglas Haig's appreciation of the situation was that the principal attack would be made in the Bourlon sector.¹ In that area he was confident his dispositions would suffice to hold the enemy. A study of the reports of the German preparations gives the impression that the enemy was not too particular about shielding his movements at Bourlon from observation, but that his movements elsewhere were made as secretly as possible. He could not, as has been indicated, conceal his interest in the whole line as far south as Vendhuille, but he did succeed, intentionally or otherwise, in attracting undue attention to the Bourlon area.

The confidence of General Head-quarters, that any attempted local German counter-attacks could be defeated,

¹ Reports of the front-line troops, of the imminence of an attack on the Third Army front, received no special attention at Third Army head-quarters and appear not to have been communicated to General Head-quarters.

is reflected in the orders given for the cessation of special bombing operations. On the 26th of November the squadrons of the I Brigade had ceased to be under the orders of Royal Flying Corps head-quarters for bombing and fighting operations in connexion with the battle, and had reverted to their routine work for the First Army. On the 28th the Ninth Wing also was ordered to resume operations in accordance with the general programme laid down before the Cambrai battle began. This programme gave a series of bombing objectives and general reconnaissance areas. The bombing targets covered a wide front and included aerodromes, railway junctions, and ammunition dumps. They were, in effect, general strategic targets for a period when no special ground operations were in progress. On the 28th and 29th of November, therefore, Nos. 25 and 27 Squadrons were in the north bombing the stations at Courtrai and Roulers.

30 Nov. The German attack at Cambrai opened between 7 and 8 a.m. on the 30th of November. After an intense but brief preliminary bombardment, one effect of which was to cut the communications between the various headquarters and the battalions of the line, German infantry, closely supported by low-flying aircraft, assaulted from Masnières to Vendhuile. The weakest link in this part of the British front was the Banteux ravine which was not only the junction between two divisions, but also marked the boundary between the VII and III Corps, and in this ravine important German forces assembled for attack unseen. The German infantry began their assault at 7.30 a.m. and, within half an hour, had overrun the Banteux ravine, taking the reserve battalions by surprise, and had captured the villages of Gonnelieu and Villers-Guislain. By 9 a.m. Gouzeaucourt had fallen and a position of considerable gravity had arisen. Metz-en-Couture, through which ran the only good road to the Bourlon salient, was threatened, and the Third Army was faced with possible disaster. The enemy, however, was robbed of the full fruits of his initial surprise by the stand made by the 29th Division at Masnières, and by the desperate resistance offered by local reserves outside Gouzeaucourt. The resistance gave time for

a counter-attack to be organized, and this, made by the Guards at noon, led to the recapture of Gouzeaucourt and to some progress being made along the Quentin ridge. In the afternoon, tanks, which had been preparing to move away from the battle area for refit, turned back to Gouzeaucourt and helped to hold the captured ground. The counter-attacks were assisted by ten D.H.5's of No. 68 (Australian) Squadron which attacked, with bomb and machine-gun, German troops in the open. By the evening, the troops at Gouzeaucourt were linked up with the British garrison at la Vacquerie, who were, in turn, in touch with the troops in Masnières, so that the British line along this section of the front had been reconstituted.

This southern attack of the enemy had achieved a tactical surprise. Although it had been expected, it developed so swiftly and with such force that the British troops were overwhelmed before they realized what was happening. The reasons for the surprise were three. The assembling of the German troops was covered from air observation by an early morning mist, the infantry assault was preceded by intensive and widespread attacks by low-flying German aircraft which not only bewildered the defending troops, but also forced them to keep their heads down so that many of them did not see the approach of the German infantry, and, finally, the German tactics were of a kind novel to the Western front. There was no long preliminary bombardment, followed by steadily advancing barrage-fire, the usual forerunners of an infantry attack. Instead, the attack began at the Banteux ravine after only a short bombardment, and, through the breach in the line that was made, German troops were pushed. It was only after this spearhead had made its thrust that the attack spread along the rest of the southern portion of the front.

Two British Corps aeroplanes were, in fact, circling over this front both before and during the initial German advance. The observers found the hollows of ground in the German area obscured by mist and the enemy concentrations passed entirely unnoticed. When the bombardment began, the air observers reported the positions of some of the active batteries, and they were engaged in

30 Nov. this work when groups of enemy aeroplanes appeared below them and began to attack the British infantry. One observer counted thirty of these low-flying aircraft in his immediate neighbourhood, and there were, in addition, two-seater aeroplanes directly co-operating with the German infantry. The two British Corps aeroplanes were soon involved in the fighting. About 8 a.m. two patrols of 'Camels' of No. 3 Squadron appeared and a series of sharp, but indecisive, engagements took place. By this time, however, the main German air activity in this area was over. The low-flying aircraft had contributed their allotted share towards the rupture of the line, and most of them, having finished their ammunition, had withdrawn.

Exactly what effect on the battle their intervention had had it is impossible to say, but there is some evidence that it was important. The general officer commanding one of the British infantry brigades that suffered in the attack stated: 'the massing of low-flying aeroplanes going immediately in front of the enemy's infantry, caused many 'casualties and proved very demoralizing.' A Court of Inquiry which assembled in January 1918 to examine the causes of the success of the German counter-offensive on the 30th of November, recorded among its findings: 'These aeroplanes came over in considerable numbers at 'the time of the assault and flew at altitudes which have 'been described by witnesses as being lower than 100 feet, 'firing their machine-guns into our infantry both in the 'front-line trenches and in rearward positions. The moral 'effect of this was very great and no doubt tended to 'facilitate the enemy's success. Our men did not seem to 'know what to do to minimize the moral effect of these 'low-flying machines. Witnesses stated that fire on them 'produced no result.'¹

¹ The German low-flying attacks were made, chiefly, by two-seater aeroplanes of the so-called 'Protection Flights' (*Schutzstaffeln*). Their original duty was to protect artillery aeroplanes working on the front, but they had been given the additional duty, during the battle of Arras, of attacking troops in trenches when they were not required for their protection duties. The *Schutzstaffeln*, as a result of experience gained in 1917, ceased to have protective duties, and became, in effect, battle squadrons, to be used as a powerful weapon of attack at the *decisive* point, when the German troops

Meanwhile, just before 9 a.m., when the anxiety^{30 Nov.} aroused by the success of the German attack on the south side of the salient was at its greatest, considerable numbers of enemy troops were seen massing on the northern flank of the salient between Bourlon and Moeuvres. Here there was no question of a surprise. The orthodox procedure of a severe preliminary bombardment, followed by barrage-fire, duly gave way to assaults by wave after wave of infantry. Once again, however, the infantry were preceded by low-flying aircraft. We have seen that preparations had been made in the expectation that the main German effort would take place in the area of Bourlon. The line was strongly held by three divisions, and it was to this sector of the front that the chief attention of the aircraft of the Royal Flying Corps was directed throughout the day. Five main German attacks were made in this area, but, after some of the most bitter fighting of the war, they were beaten off. Here and there the line was pushed back a little but, except along a small stretch of front west of the Canal du Nord, it was restored again by counter-attacks.

The first waves of German infantry came over soon after 9 a.m., but some time before that German and British aircraft were in force over the front. The 'Camel' pilots of No. 3 Squadron, and the D.H.5 pilots of No. 64 Squadron and of No. 68 (Australian) Squadron, flew back time and again to the battle area to drop their bombs and fire their machine-guns against the assaulting formations of German infantry. The enemy low-flying pilots, at the same time, maintained a prolonged offensive against the British infantry. Their efforts were punctuated by combats of flashing swiftness with the Royal Flying Corps

were on the offensive, and to impede, or break-up, an enemy attack, when the German troops were on the defensive. This change of duties was indicated by a change of name to *Schlachtstaffeln* (Battle Flights). They were concentrated, as required, into squadrons or into Groups (*Schlachtstaffelgruppen*). An important German memorandum on the *Employment of Battle Flights*, dated 20th February 1918, which incorporates the lessons learned from the British low-flying tactics during the battles of Ypres, 1917, and from the German and British attacks at Cambrai, is reprinted as Appendix XII.

30 Nov. fighters. Above the low-flying aircraft were the contact and artillery aeroplanes of both sides, and formations of offensive-patrol aircraft. A distant offensive patrol of S.E.5a's of No. 41 Squadron, which had gone out at 8.30 a.m., had found no enemy aircraft, and thereafter the offensive patrols were brought in to the actual battle area. Often, during the day, there were fifty or more aeroplanes of the Royal Flying Corps over the five-mile front from Moeuvres to Fontaine and as many of the enemy. 'An 'absolute mêlée of aircraft around Bourlon Wood', says one pilot's report, and 'the air was thick with D.H.5's, 'some S.E.5's, R.E.8's, and Bristol Fighters', says another.

This concentration led to almost continuous fighting and the co-operating aircraft on both sides found their work of helping the infantry and artillery much impeded. The low-flying pilots, however, were more difficult to engage, and both the German and British infantry were subjected to heavy attacks.¹ It is easier to give specific evidence of the effect of the German attacks on British troops, than the opposite, but it may be assumed that the parallel of any example from the records of one side can be produced from those of the other. Soon after 2 p.m., when a fierce enemy attack was made on the position held by the 140th Infantry Brigade on Bourlon Hill, eight German aeroplanes first appeared at a low height and fired on the British front-line infantry. The closely following enemy troops forced their way into the British line, and the German supporting aircraft then turned their attention to the British reserves. They did particular damage to a reserve company as it was assembling for a counter-attack behind a sunken road. Shortly afterwards another group of six German aeroplanes appeared, and the two groups fiercely and repeatedly dived to the attack of the British reserves as they moved forward to counter-attack the German infantry. 'The enemy aeroplanes', says a report of the divisional commander, 'were handled with 'considerable skill and daring, and the effect of the aerial 'fire on troops already heavily engaged was very harassing.

¹ Royal Flying Corps aeroplanes dropped one hundred and eleven 25-lb. bombs and fired 20,000 rounds of ammunition against ground targets.

'It was noticed that when the first counter-attacks were delivered, the aeroplanes concentrated their fire on the ground in front of and over which the troops advanced.' A subsidiary, but important, effect was that some of the infantry Lewis gunners expended most of their ammunition against the low-flying German aeroplanes before the enemy troops came over, and the defence in parts of the line was thereby weakened.

As a result of the day's air fighting, eleven German aeroplanes were destroyed, seven British pilots were reported missing, and five flying officers were killed and four were wounded.

On the night of the 30th November/1st December Nos. 101 and 102 Squadrons once again gave their attention to the Cambrai battle area. Their main targets were the stations at Douai, Dechy, and Marquion.

On the 1st of December the battle on the ground continued fiercely. The Guards, with the help of tanks, completed the capture of the Quentin ridge and entered Gonnellieu. Farther south, Gauche Wood was taken, but attacks on Villers-Guislain failed. There was heavy fighting at Bourlon and Marcoing and at Masnières, where nine German attacks were beaten off by the 29th Division. The position of the troops at Masnières, however, was precarious and, during the night, the British line was withdrawn west of the village.

Mist and low clouds made the day unfavourable for flying and the German air service was inactive. Many low-flying attacks, however, were made by Royal Flying Corps pilots on the German infantry and, at the same time, the pilots followed and reported much of the progress of the British infantry and tanks, particularly east of Gouzeaucourt. Close reconnaissances and contact patrols, made by aeroplanes of the Corps squadrons, Nos. 15 and 59, yielded fairly comprehensive reports of the day's fighting, while wider reconnaissances by the Bristol Fighters of No. 11 Squadron showed that abnormal movements behind the German lines had ceased. There were no more than five combats during the day, as a result of which three German aeroplanes crashed. One British aeroplane was missing,

and four officers were wounded. Two British balloons were shot down, one of them in flames.

In the afternoon of the 2nd of December strong German attacks gained ground at la Vacquerie and west of Gonnellieu. Next day the attacks were resumed and la Vacquerie fell, thus making the British position beyond the Canal de L'Escaut precarious: during the night, therefore, the troops were brought in to the west bank of the canal. For two days there was local fighting at la Vacquerie, but elsewhere the battle-front quietened. The general British position, however, was extremely unsatisfactory. With the enemy in possession of the Bonavis ridge, the troops in the salient north of Flesquières must remain endangered. The recapture of the ridge would entail a major engagement for which the necessary troops were not available, and Sir Douglas Haig, therefore, with great reluctance, decided that he must abandon the Bourslon position, so stubbornly won and defended, and withdraw to the Flesquières ridge. This difficult operation was begun on the night of the 4th of December and completed by the morning of the 7th, thus ending the battle of Cambrai.

During these days of local fighting and readjustment of the line, the air activity on both sides lessened. Low-bombing and machine-gun attacks on the German troops were maintained, but on a minor scale, and there was a fair amount of air photography. In the five days, from the 2nd to the 6th of December, no more than three German aeroplanes were shot down (two of them in the British lines by Captain J. T. B. McCudden), while three British aeroplanes were destroyed and two were missing.

The battle of Cambrai, although it achieved little, is one of the most interesting operations of the war. All the German accounts of the battle talk of the possibility of a catastrophe as a result of the British opening success, and express wonder at the failure to exploit the situation. 'Exploitation', it has been said, 'was the chief idea of the 'battle',¹ but although more might have been done, the fact remains that the action was of limited scope, and that

¹ *Sir Douglas Haig's Command, 1915-1918*, by G. A. B. Dewar and Lieutenant-Colonel J. H. Boraston, vol. i, p. 397.

reserves were not available for extensive operations. There was some similarity between the German counter-offensive on the 30th of November and the original British attack. The enemy took a weak section of the British line by surprise and achieved an initial success which he failed to exploit fully. Had some of the troops who were thrown, wave after wave, into the abortive Bourlon attacks, been kept available for rapid action in the southern part of the line, once this had been breached, the Bourlon positions would most likely have been made untenable without any costly frontal attacks, and worse might have befallen. Even as it was, however, the Germans were able to advertise a victory which they sorely needed to reconcile the civilian population to a winter of great self-sacrifice, and the German High Command had learned some lessons from which they were to profit in 1918.¹

The feature of the battle so far as concerns the air services was the development of low-flying attacks on the infantry, and an extension of this activity, in future battles, was foreshadowed. That the intervention of the low-flying aircraft had an influence on the battle is beyond dispute, but the lessons of that intervention deserve close examination. The casualties to the low-flying aircraft were high, averaging, as has been told, 30 per cent. for each day on which aeroplanes were used on this duty. That is to say, a squadron of highly skilled and experienced pilots, flying first-class fighting aircraft, would, so long as it was employed on concentrated low-flying attacks on front-line troops in prepared defensive positions, require to be replaced about every four days. Only if the ground operations were of a decisive kind calling for the immediate and full weight of every arm, or else in extreme emergency, would such a rate of wastage be justified. The pilots could not easily be replaced, and persistent low-flying attacks, with consequent heavy casualties among the fighting pilots, would have greatly restricted the ability of

¹ 'It was a good ending to the extremely heavy fighting of 1917. Our action had given us valuable hints for an offensive battle in the west, if we wished to undertake one in 1918.' (Ludendorff, *My War Memories*, vol. ii, p. 497.)

the Royal Flying Corps to maintain its offensive patrol policy on which the whole of the air co-operation with the army depended. The low-flying attacks at Cambrai did, in fact, have some effect in disorganizing the offensive patrol system with the consequence that, when the reinforcements of German fighting aircraft began to make their presence felt, some of the Royal Flying Corps bombing formations were, as a temporary measure, given strong escorts of single-seater fighters, and the fighter reconnaissance formations were increased in size.

The German air service deserves full credit for the rapidity with which its concentration was made once the danger had been revealed, for the clarity of vision which enabled the command to judge the essentials of the situation, and for the vigour and precision with which that judgement was implemented. The German view was that their counter-offensive could best be helped by the use of the maximum strength of aircraft, as weapons of attack, at a decisive time and place. The enemy low-flying attacks were very closely co-ordinated with the movements of the German infantry. They played a part in the success of the German counter-attack at Cambrai, but it should be pointed out that this form of low-flying attack was, at least in its scope, new to the British infantry so that part of its effect was due to the advantage of surprise. Nevertheless, the enemy command was deeply impressed, not only by the results of the German low-flying attacks in the Cambrai counter-attack, but also by the many occasions throughout 1917, at Arras, Messines, Ypres, and Cambrai, when the German infantry had had to suffer similar attacks from Royal Flying Corps pilots. It may be assumed that much of the material, on which the German staff memorandum of February 1918 (Appendix XII) was based, was provided by the experiences of the German troops who had suffered low-flying attacks. The development of low-flying tactics throughout the war, and the lessons applicable to this form of air activity, will be reviewed in the final volume. Meanwhile, an extract from the German memorandum deserves repetition here because of its general interest. 'The employment of low-flying aeroplanes on

'the battle-field,' we read, 'and their co-operation in the fighting on the ground, by opening machine-gun fire or attacking with bombs and hand grenades, is particularly effective from the point of view of *moral*, both on our own and the enemy's troops. The systematic participation in the battle of massed flying formations (battle flights) against ground targets is of extreme importance. In the attack, battle aeroplanes fly ahead of and carry the infantry along with them, keeping down the fire of the enemy's infantry and barrage batteries. In the defence, the appearance of battle aeroplanes affords visible proof to heavily engaged troops that the higher command is in close touch with the front, and is employing every possible means to support the fighting troops. Confidence in a successful defence is thereby strengthened. The object of the battle flights is to shatter the enemy's nerve by repeated attacks in close formation and thus to obtain a decisive influence on the course of the fighting. They cause confusion to a considerable distance behind the enemy's front line, dislocate traffic and inflict appreciable losses on reinforcements hastening up to the battle-field. . . . In the battle flights, the higher command possesses a powerful weapon which should be employed at the *decisive* point of the attack. . . .'

During the Cambrai operations the importance of the part played in modern battles by air observation was well illustrated. On the opening day the mist just sufficed to obscure from the air observers the cause of the hold-up at Flesquières, and this check, we have seen, was a major reason why the Bourslon ridge was not overrun before nightfall. Had the visibility been better the cause of the trouble at Flesquières would probably have been made clear and artillery fire could have overcome the German resistance. Again, on the day of the German counter-offensive, mist played a part and, although British aeroplanes were flying over the German troops while they were assembling for the attack in the south, the observers saw and reported nothing, and the enemy surprise was complete, with results that, for a time, gravely threatened the whole of the Third Army.

CHAPTER VII

THE GERMAN OFFENSIVE, 1918

The First Battles of the Somme, March 21st–April 5th

[Maps, pp. 267 and 364]

THE battle of Cambrai, although it has been described as a raid on a grand scale, had deep significance. The British advance on the 20th of November 1917 had shown that new tactics, with the help of surprise, might shatter the line in the west, and the German counter-stroke on the 30th had not only indicated a new enemy strength and temper, but had also, for those who could read the lessons, foreshadowed some of the possibilities of the German campaign of the spring of 1918. The British defence at Cambrai, especially along that part of the line which had been in our possession since the beginning of 1917, had been carefully organized on the elastic system which the enemy had used with marked success. The line was held with the minimum of troops, but the strong-points, of considerable strength and depth, were so placed that they could support one another and cover the whole front. On the 30th of November, after a brief bombardment, mainly with smoke and gas shells, the troops holding many of the advanced posts had suddenly found themselves taken in flank and rear. Their resistance had depended on a clear field of fire which would enable them to break up the attacks, but their view had been restricted by a morning mist, and the German troops had poured through the gaps thus created in the defence. British General Headquarters was inclined to the belief that the weakness had not been in the method of defence, but in the inability of the troops, through lack of training, to practise it with the required faith and skill. The General Staff therefore decided that the troops, through the winter, should be carefully instructed in the tactics of elastic defence, that the defence systems must be overhauled and brought up to date, and that every possible precaution must be taken to provide against surprise attacks.

The general situation was, for the Allied commands,

full of disquiet. Russia had ceased to fight, and the bulk of the German and Austrian troops on the Eastern front had become available for transfer to the west. Ludendorff had additionally at his disposal at least four thousand guns taken from the Russians and two thousand from the Italians, as well as great stores of captured war material of all kinds. The French armies were still suffering from the effect of the 1917 spring offensive and the British had been greatly weakened by the losses sustained in the costly battles that had been fought almost continuously throughout the year.

The change in the outlook on the Western front is revealed by the preoccupations of the opposing headquarters' staffs during the winter of 1917-18. For years the British mind had been dominated by problems of attack, for which the troops had been trained almost exclusively, but after Cambrai the offensive ceased to be a subject for debate. Instead there was a comprehensive and searching examination of the defensive role of every arm and, on the 14th of December 1917, a General Head-quarters paper, *Memorandum on Defensive Measures*, advertised the change in policy to the armies and defined the principles which must be followed. Three zones of defence were to be prepared, each organized in depth with several successive lines, either continuous trenches, or groups of trenches, strong-points and machine-gun emplacements, with switches to connect their principal lines. The 'Forward Zone' was to coincide generally with the existing front system; the 'Battle Zone' was to be elaborated on the best ground available for fighting behind the Forward Zone (in fact, usually a mile to two miles distant); while the 'Rear Zone' was to constitute a line on which the defence could fall back, if necessary, about four to eight miles behind the Battle Zone. Owing to shortage of labour, however, the Rear Zone was at first only to be reconnoitred, then marked out, and, afterwards, as opportunity offered, wired and constructed. The defence schemes were elaborately thought out, but they failed to make provision for one important element—the weather. While the British eyes were thus fixed on the ground in their

possession, the German staffs were looking far afield—to the Channel ports, to Paris, to a dictated peace. The laboriously compiled memoranda dealing with defence were pushed aside: every thought was directed to the details of the great offensive, and, on the 1st of January 1918, a manual, *The Attack in Position Warfare*, signed by Ludendorff, was issued to the German armies.¹

Sir Douglas Haig had no illusions about the task ahead of him. He made powerful and repeated requests for reinforcements. It was not only essential, he urged, that his depleted divisions should be brought up to full strength, but the troops must arrive early so that they could be trained in the latest methods of conducting defensive battles before the ordeal came upon them. The Government, however, gravely perturbed by the prodigality, as it seemed to them, with which men and material had been thrown into the 1917 battles, mindful that the last reserves of British man-power were in question, and inspired by the hope that American troops would arrive early in 1918 in sufficient numbers to restore the balance in the west, held back. Mr. Lloyd George, the Prime Minister, says Mr. Winston Churchill, 'did not feel that, if the troops were 'once in France, he would be strong enough to resist those 'military pressures for an offensive which had so often overborne the wiser judgement of Statesmen. He therefore 'held, with all his potent influence, to a different policy. 'He sanctioned only a moderate reinforcement of the 'army, while at the same time gathering in England the 'largest possible numbers of reserves. In this way he believed he would be able alike to prevent a British offensive 'and to feed the armies during the whole course of the fearful year which was approaching. This was in fact achieved. 'But I held, and hold still, that the War Cabinet should 'have been resolute, as I believe it would have been found 'strong enough, at once to support and to restrain the 'High Command in France.'²

The weakened British divisions in France were reorganized, under instructions from the Army Council,

¹ A translation of Section VI of this manual, outlining the role of the air forces, is reprinted as Appendix XIII. ² *The World Crisis*, Part II, p. 378.

from a twelve battalion to a nine battalion basis, a change, completed during February 1918, which not only reduced their fighting strength, but had also, owing to the consequent introduction of new tactical methods, some effect on their fighting efficiency.¹ The problems confronting Sir Douglas Haig were made more serious by a British Government decision of September 1917 that the British line in France must be extended to include a considerable stretch then held by the French. Sir Douglas Haig had laid down as a condition of successful defence, in a memorandum to the Cabinet, 'No further extension', but he was overruled and, after much discussion, he agreed with General Pétain to extend the British right to Barisis, south of the river Oise, which would make him responsible for an additional twenty-eight miles: this extension was completed by the end of January 1918.²

Towards the end of December 1917 Major-General Trenchard had submitted to General Head-quarters a memorandum outlining his views on the employment of the Royal Flying Corps if the enemy began an offensive on a big scale. This document, after discussion and minor emendation, was issued by General Head-quarters to all armies on the 16th of January 1918.³ It was made clear that, although the army was on the defensive, the air offensive must be maintained. The first and most important duty of the Royal Flying Corps, it was stated, was to watch for symptoms of attack and to use every means to obtain and transmit information which might assist responsible

¹ The decision to reorganize the divisions in France on a reduced establishment is closely bound up with the difficult question of the allocation of man-power. This question so far as it concerns the air services will be briefly dealt with in a later volume. But it may be mentioned here that a Government Committee had, in December 1917, adopted the following order of priority for the distribution of man-power: first, the fighting requirements of the Navy and the air services, second, ship-building with, but after it, the construction of aeroplanes and tanks, and third, food production, timber felling, and the provision of food storage accommodation.

² When Monsieur Clemenceau came into power in November 1917 he had pressed for an extension of the British line to Berry-au-Bac. The Supreme War Council actually decided on an extension to the river Ailette.

³ *The Employment of the Royal Flying Corps in Defence*. Appendix XIV.

commanders to know when, where, and in what force, an attack might be expected.

When the extension of the British line was completed, the right was held by the Fifth Army commanded by General Sir Hubert De la P. Gough, its front extending from north of Gouzeaucourt, where it joined the Third Army, to the junction with the French at Barisis. Meanwhile, although there was no question that a large-scale German offensive must be expected, there was considerable speculation about where the blow or blows would fall. The German preparations, in fact, were widespread, but, by the beginning of February 1918, the Fifth Army Commander was convinced that the main enemy attack would be made against the Third and Fifth Armies with Amiens as the objective, and, at a conference held at Fifth Army head-quarters on the 3rd of February, General Gough outlined his appreciation of the general situation to his subordinate commanders.¹

The conclusions of the Fifth Army Commander were influenced by the reports of the air observers. The weather throughout the month of January hindered observation, but the air reports, and, more particularly the air photographs, gave many clues to the German intentions. Opposite the fronts of the Third and Fifth Armies new

¹ The German plans will be fully dealt with by the military historian in *Military Operations 1918*, vol. i. Various plans had been prepared. The one eventually adopted was called the *Michael Attack*, on both sides of St. Quentin. Among others for which preparations were made were *Mars*, near Arras, and *George*, near Armentières. The final decision for *Michael* was given by Ludendorff on the 21st of January 1918. The plans are also discussed in Ludendorff's *My War Memories*, pp. 589-93, and Hindenburg's *Out of My Life*, pp. 344-6. At the outset the main offensive was against the Third Army with the object of smashing the Arras bastion and striking towards the coast. Such action would separate the bulk of the British Army from the French and crowd it up with its back to the sea. 'It was decided to strike between Croisilles, south-east of Arras and Moeuvres, and, omitting the Cambrai re-entrant, 'between Villers-Guislain and the Oise south of St. Quentin. It was to be 'supported on its left by a subsidiary attack from La Fère.' (Ludendorff, p. 591.) The main direction of attack was changed after a few days largely as a result of the resistance of part of the British Third Army and the depth of the German advance against the Fifth Army. Amiens then became the main objective.

aerodromes, dumps, railway sidings, and hospital encampments were discovered. By the end of January, for example, fourteen new aerodromes had been found east of the forest of St. Gobain, opposite the right of the Fifth Army. Widespread and abnormal railway movements were reported from time to time. On either flank of the line held by the Fifth Army, it was made clear, the Germans were showing great activity in their forward areas.

General Gough has recorded that some time in January 1918 he learned that General von Hutier had appeared opposite his front in command of the German Eighteenth Army.¹ This commander, he knew, had served almost continuously on the Russian front, where he had been responsible for successful large-scale attacks, notably at Riga. The Fifth Army Commander obtained from French general headquarters a pamphlet, prepared by the French General Staff, in which the German preparations and tactics at Riga, as well as those at Caporetto, were closely analysed. He was thus able, at the conference on the 3rd of February, to outline to his commanders something of what they might expect. Hutier, he told them, had, at Riga, relied on surprise. He had kept the troops, who were to make the attack, seventy miles away from the front until a few days before the offensive when they were assembled in the forward area. The battle had not been preceded by any tell-tale registration of the Russian gun and trench positions, and the bombardment before the infantry assault had lasted no longer than five hours. Sir Hubert Gough went on to define the principles on which the Fifth Army would fight a defensive battle.²

¹ See *The Fifth Army*, pp. 227-8. Sir Hubert Gough says he discovered this from a letter published in a Baden newspaper, signed Hutier, which had been sent to the mother of a German airman shot down on the Fifth Army front. The combat cannot be traced among official records. A General Head-quarters Summary of Information, dated the 5th of January 1918, gave a report that Hutier had taken over part of the line in the St. Quentin area. A later summary, on the 14th of January, offered confirmation. An obituary, it was said, of a divisional commander, known to have been at St. Quentin, had appeared in a German publication over the signature of General von Hutier.

² A General Head-quarters memorandum, laying down the 'Principles

Throughout the month of February indications of the impending offensive accumulated. On the 2nd of February Major-General J. M. Salmond¹ stated that it was desired that the head-quarters reconnaissance squadron—No. 25—should concentrate its observation on the country behind the Fifth Army reconnaissance area. He also took measures to expand the Fifth Army's Bristol Fighter Squadron—No. 48—by eight aeroplanes so that closer attention could be given to the area within the reconnaissance boundaries of the Fifth Army front. There came almost daily air reports of increasing train movements behind the Third and Fifth Army fronts, and of further new dumps, aerodromes, and emplacements.

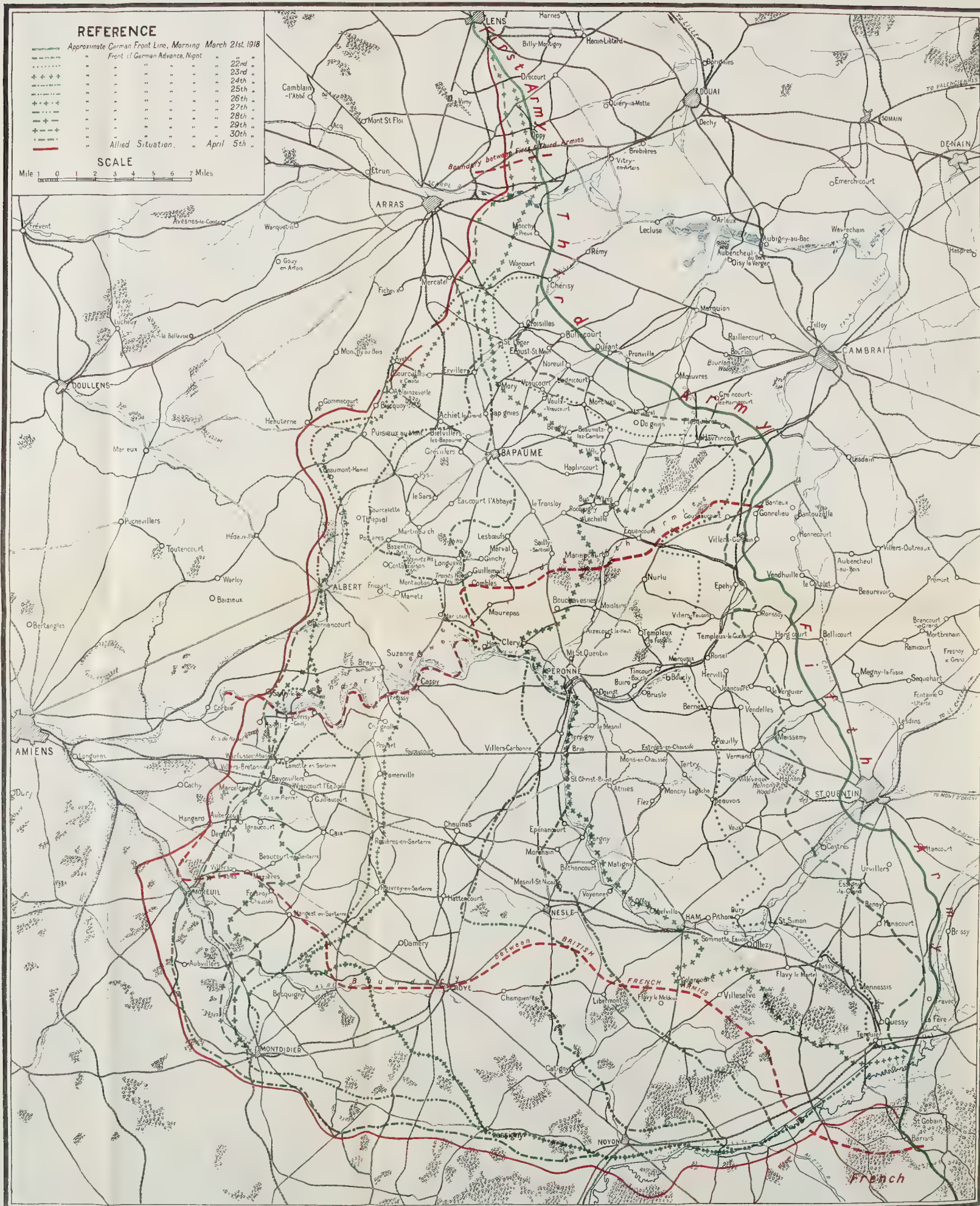
Although the signs had multiplied and left little doubt in the mind of the army commanders immediately concerned, General Head-quarters were naturally slower in coming to a definite conclusion. At a conference of his army commanders held at Doullens on the 16th of February, Sir Douglas Haig outlined his appreciation of the situation. He gave his view that the Germans would launch a great offensive in the west and that the economic position in Germany might force the enemy to begin his attacks in March or before. The British must be prepared to be attacked on a wide front, possibly from Lens to the Oise, but the main blow, if the Germans attacked early, would probably be made, he thought, against the French. 'Indications from the British front are that no attack in 'strength in Flanders is possible at the moment, and that 'there are at present no signs of any big offensive being 'imminent on the rest of the British front. The possibility 'of a small attack on our First Army front is indicated by 'artillery registration and forward gun positions. It would 'be unwise to disregard the tempting objective formed by 'our transport deficiencies in the devastated area.'²

of Defence on the Fifth Army Front', was received by General Gough on the 4th of February 1918.

¹ Major-General J. M. Salmond succeeded Major-General Trenchard in command of the Royal Flying Corps in France on the 18th of January 1918. Major-General Trenchard returned to England to take up the appointment of Chief of the Air Staff in the newly created Air Ministry.

² Extract from the statement given at the conference as circulated by the

GERMAN OFFENSIVE ON THE SOMME. MARCH, 1918.



If General Head-quarters, watching the whole field of operations and the German preparations along a great part of the Western front, and mindful of the French view that the German attack would have Paris for its objective, was reluctant to dwell unduly on the enemy activity in the Cambrai-St. Quentin area, it was not long before new facts helped them to come to a conclusion.

It was stated at another General Head-quarters conference, on the 21st of February, that instructions, dated February the 15th, had been found in the pockets of a dead German aviator cancelling all previous photographic orders, and directing that photographs be taken of the front between Croisilles and Havrincourt with oblique photographs of the British front line. Photographic reconnaissances were also ordered inside the German lines from Bullecourt along the Sensée river to Wavrechain and back to the front through Raillencourt and Graincourt. This instruction appeared to British head-quarters to indicate German anxiety about how far the preparations in this area were visible from air. It was known also that German bombing aircraft had received orders to attack on the Croisilles-Havrincourt front to a depth of seven miles.

A week after the Doullens conference, on the 24th of February, Major-General J. M. Salmond, at a meeting with the commanders of the Royal Flying Corps brigades, explained that everything pointed to an impending attack between the Sensée river and St. Quentin.¹ He emphasized the importance of systematic and detailed air reconnaissances of this area as an aid to defining the time of the attack. He explained also that there were indications that the Germans were holding back a great part of their air units, possibly for training in co-operation with the formations which were to make the attack. Every effort, he said, should be made to confirm this: a release of such Chief of the General Staff on the 17th of February 1918. The devastated area was that laid waste when the Germans retired to the Hindenburg Line in February 1917. It included the area of the Fifth Army and part of the Third.

¹ A General Head-quarters Summary of Intelligence, dated the same day, stated that wireless evidence seemed to point to a possible offensive between the Scarpe and Bellicourt.

air units for work over the front might be a pointer to the imminence of the offensive.

Towards the end of February the air reports and photographs revealed a marked increase in German rail and road movements in the threatened area, and showed a further accumulation of dumps, light-railways and aerodromes.¹ At a conference of army commanders held at Doullens on the 2nd of March, it was stated that the indications were strong 'that the enemy intends to attack on the Third and 'Fifth Army fronts with the object of cutting off the 'Cambrai salient and drawing in our reserves'. The Royal Flying Corps must be prepared, it was ordered, to meet a concentration of enemy air forces on the threatened front, and also to concentrate its bombing efforts on the enemy's areas in rear of that front. It is clear that General Headquarters were still not anticipating a general attack on the Fifth Army. What they had in mind was an offensive designed to cut off the Cambrai salient and an operation of this nature would not involve the whole of the Fifth Army, but only its left.² It was discovered, from air-photographs, about this time, that the enemy had drained an important section of the St. Quentin Canal, between Honnecourt and Banteux, while, farther north, he had built new roads and bridges across the Canal du Nord.

Statements issued by the Fifth Army head-quarters staff on the 9th of March said the indications were that the attack would come 'in the near future', while the Third Army, two days later, spoke of 'the immediate future'. Each day the reconnaissance reports and air photographs added something. Particularly noticeable was a daily extension of the network of light-railways behind the

¹ General Headquarters knew, also, by the 25th of February that General Otto von Below, who had fought the battle of Caporetto, was holding the front north of the Cambrai-Bapaume road. He was described in a General Headquarters Summary of Information, dated the 26th of February, as 'probably the best Army Commander in the German Army', and his appearance opposite the British was stated to be 'the greatest compliment the Germans can pay the British Army'.

² On the 8th of March, at another General Headquarters conference, it was stated that there were no indications of an enemy attack south of St. Quentin.

German lines, a growing concentration of German air units, and an abnormal number of lights in enemy back areas reported by night-flying pilots. On the Third Army front there was a notable example of the value of air photography. Some small white objects were revealed on photographs of the Bullecourt area and a 9.2-inch howitzer was ranged on them. Explosions which followed showed that the objects were boxes of ammunition, and a general bombardment was thereupon ordered with the result that over one hundred explosions were counted.

As the day for the attack drew near, clouds thickened over the whole area and rain set in. For four days, from the 17th to the 20th of March inclusive, early morning air reconnaissance was impossible. But on the morning of the 18th ground observers reported abnormal road movements in the forward area, and many staff cars, and that German officers had been seen studying the British line along a great part of the Fifth Army front. On the same day a German non-commissioned officer pilot was brought down and he revealed that the German attack would be made on the 20th or 21st of March. Large air formations, he said, had been assembled opposite the front south of St. Quentin, but they had been used sparingly and would not disclose their full strength until the battle began. Next morning, the 19th, various German prisoners confirmed that the preparations were complete and the attack about to begin. Before dusk on the evening of the 20th, reports from air observers showed that troops in the front line in both the Third and Fifth Army fronts were being relieved. That night, the warning was conveyed to the various Corps that the attack could be expected next morning, March the 21st. The matters which remained in doubt were whether the first attack would be the main effort or merely preparatory, and whether the French would be attacked at the same time.

The information supplied by the Royal Flying Corps about the German preparations before the battle opened formed a part only of the great mass of evidence accumulated and sifted by the various intelligence staffs. But, in truth, the air reconnaissance reports and air photographs,

taken alone, give an impressive picture of the marshalling of men and material and of the preparation of the ground for the great attack. General Ludendorff, writing after the war, said: 'On the 20th of March, along the whole front of the attack, the guns and trench mortars, with their ammunition, were in position behind, in, and in places even in front of, the foremost trenches. . . . The divisions had at first been distributed behind the front of attack, but were now crowded together in anti-aircraft shelters, behind the jumping-off places in our foremost lines. This concentration of 40 or 50 divisions had not been observed by the enemy, nor had it been reported to him by his highly developed secret service. The marches took place at night, but the troops sang as they passed through the villages. Such masses cannot be concealed. But no more did the airmen discover the railway transport that had been taking place behind the front of attack since February. It was heavy behind the whole Front, but the bulk of it was unmistakably going on behind the line Arras-La Fère, as was told us by German airmen sent up to report. Nor did the enemy discover anything by other means. I must assume this: otherwise his defensive measures would have been more effective, and his reserves would have arrived more quickly. In spite of all efforts to the contrary, the essence of war is uncertainty; that is our experience, and the enemy's too.'¹

It is clear that had General Ludendorff had access to the British intelligence files before the battle he would have found much that was revealing. He has made reference, in the extract quoted above, to the ineffectiveness of the British defensive measures. This is no place to analyse the British Commander-in-Chief's dispositions to meet the German onslaught. Briefly his view was that he could afford to give ground in front of Amiens, as he could afford to give it nowhere else. In the Somme area there was room for manœuvre. The enemy might advance an appreciable distance before objectives vital to the maintenance of the British army were uncovered. In the north, however, only some fifty miles from the German

¹ *My War Memories*, p. 596.

jumping-off places, were the Channel ports, objectives of glittering and perhaps decisive importance. In that congested area no risks could be taken. Sir Douglas Haig, therefore, kept his main strength and reserves in the north. But although ground might be given on the British right, there were elements of grave danger. The enemy must be made to pay dearly for the ground won. He must not be allowed to come on too quickly, nor bite too deeply. His advance must be halted before it endangered the lateral communications between the British and French armies, or, indeed, threatened to divide those armies altogether. The responsibilities which Sir Douglas Haig, and he alone, had to bear were onerous in the extreme. He must make his right wing, that is, the Fifth Army, strong enough to do what his strategic conception of the situation demanded, but he could not do this at the expense of weakening his hold in the north. In the event, only by the thinnest of margins was disaster in front of Amiens averted.

Air concentrations for the battle

[Map, p. 364]

On the 19th of February, while there was still uncertainty about the front on which the enemy would make his attack, a memorandum issued by Royal Flying Corps head-quarters had laid down three schemes of aircraft concentration to meet a German offensive against any two of the four British armies, that is, the Second and First Armies in the north, the First and Third Armies in the centre, or the Third and Fifth Armies in the south. Following the conference at Doullens on the 2nd of March at which the probability of an attack on the Third and Fifth Army fronts was accepted, the scheme for the air concentration in the southern area was put into operation. By the 7th of March the three single-seater fighter squadrons of the head-quarters Ninth Wing, namely, No. 73 ('Camel'), No. 79 ('Dolphin'), and No. 80 ('Camel'), one fighter reconnaissance squadron, No. 62 (Bristol Fighter), and two day-bomber squadrons, Nos. 25 and 27 (D.H.4's), had moved to aerodromes behind the Fifth Army front.

One of the night-bombing squadrons of the wing, No. 101 (F.E.2b), was already working from the Fifth Army area;¹ and another, No. 102 (F.E.2b), moved to the Third Army area on the 5th of March. On the 6th of March No. 83 (F.E.2b) Squadron arrived in France to reinforce the head-quarters night-bombing strength. This squadron, however, went to Auchel, in the First Army area, and, together with the remaining Ninth Wing F.E.2b Squadron—No. 58, in the Second Army area—was employed, for the time being, for night attacks on the German aerodromes in the north from which formations set out to bomb English towns.²

It is of interest that, throughout the winter, instruction in the technique of co-operation between aircraft and other arms, and in the general capabilities and limitations of aeroplanes, had been given to commanders of infantry brigades and battalions, of divisional artilleries and of artillery brigades, and to general staff officers. After the battle of Cambrai, No. 6 Squadron at Bertangles, commanded by Major A. W. H. James, had had its observers dispersed to other squadrons, and had begun a series of four-day courses for twenty-four officers at a time from each army.³ The officers did a number of hours flying (not over the lines) to study the appearance of the ground from various heights, the effect of atmospheric conditions on the visibility of objects, &c., and they watched, from the air, practical demonstrations in aircraft and infantry co-operation by means of flares and other signalling devices. There

¹ No. 101 Squadron had been moved to the Fifth Army area on the 16th of February 1918, to make attacks on the German aerodromes, notably at Etreux, which housed night-bombing squadrons active against the Third and Fifth Army areas and against Paris.

² On the 6th of March the head-quarters squadrons were grouped to form the IX Brigade, made up of two Wings, the Ninth (Day) and the Fifty-Fourth (Night). The Ninth Wing included Nos. 73, 79, 80, 62, 25, and 27 Squadrons, and the Fifty-Fourth Wing, Nos. 58, 83, 101, and 102 Squadrons. Until the 26th of March, however, the Ninth Wing operated under the direct orders of the Royal Flying Corps head-quarters.

³ No. 6 Squadron had moved to Bertangles from the Ypres area on the 16th of November 1917 for attachment to the V Corps, then in reserve. The task allotted to this Corps was the exploitation of a break-through, but the Corps did not come into action.

were also lectures by which the army officers who attended the course were given a good general idea of the Royal Flying Corps organization, and specific information about the possibilities of co-operation with their own particular arm. These courses of instruction continued up to the time of the opening of the German offensive.

On the 21st of March, when the offensive opened, the order of battle of the Royal Flying Corps was as shown in Appendix XV. Excluding the two head-quarters night-bombing squadrons detached north of the battle area, there were thirty-one squadrons in the area of the Third and Fifth Armies, with a total of 579 serviceable aeroplanes¹ of which 261 were single-seater fighters. Opposed to these two British armies were the German Seventeenth, Second, and Eighteenth Armies, with squadrons totalling 730 aeroplanes of which 326 were single-seater fighters.² For the first time the German air concentration for a battle on the Western front was greater than that of the Royal Flying Corps.

The German air preparations for the 1918 offensive deserve particular examination. After the entry of America into the war in April 1917, newspapers in the Allied countries gave exaggerated forecasts of the arrival on the Western front of great fleets of American aircraft. ('According to them', wrote General von Hoepfner, 'thousands of American aviators were going to swarm over Germany and force her to sue for peace').³ The German air authorities, mindful of the fact that America possessed

¹ The number of aeroplanes on the charge of the squadrons, serviceable and temporarily unserviceable, was 618.

² For a comparative statement of the British and German air strengths see Appendix XVI. The figures for German aeroplanes, supplied by the President of the *Reichsarchiv* for this history, are approximate only. The nominal strength of the German air units was 50 per cent. higher than the figures quoted above. The *Reichsarchiv* have calculated the actual strength as two-thirds of the nominal strength. It is of interest that British Intelligence summaries, compiled at the time, give figures for the German air strength which agree almost exactly with the figures for *nominal* strengths as supplied by the *Reichsarchiv*.

³ *Deutschlands Krieg in der Luft*, p. 140.

only a negligible aviation service, and that effective military air squadrons could not be organized in a few weeks, were not perturbed by these forecasts. They did, however, appreciate the vast resources of the United States and anticipated that, under the guidance of British and French engineers, American industrial concerns would be rapidly adapted for aircraft and aero-engine production. In the summer of 1917 the British and French press called continuously for a strengthening of the air arm. The insistent advocacy of the London *Daily Mail*, in particular, seems to have impressed the German authorities. The appointment of Mr. Winston Churchill as Minister of Munitions in July 1917 had prompted the enemy to expect strenuous efforts of production which would lead to a great increase in the manufacture of aircraft.¹ The agitation in England, powerful and insistent, for the formation of a separate Ministry for Air also foreshadowed a growth in British air strength.

The German air authorities, weighing these various factors, decided that they must reckon with a formidable growth of Allied air power which would become effective not later than the spring of 1918, and that, if this menace was to be met and countered, the whole German system of aircraft production must be overhauled. Something drastic, almost revolutionary, was called for. Although an expansion of the German air service could only be achieved at the expense of other arms and of tanks, the German High Command did not hesitate. They gave their authoritative support to the requests formulated by the General Officer Commanding the air service, and made it clear that those requests must be given full precedence. A programme of expansion, called the *American Programme*, was drawn up at the end of June 1917. This allowed for a doubling of the number of fighter Flights (from forty to eighty),² for seventeen additional artillery

¹ 'The choice of such an energetic personality as Churchill as Minister of Munitions, responsible among other things for the manufacture of aero-planes, portended an increase in English aircraft.' (*Deutschlands Krieg in der Luft*, p. 139.)

² The nominal strengths of the enemy Flights were: fighters 14; recon-

Flights, and for a corresponding growth in the home training organization. The satisfaction of the programme requirements would call for a production of 2,000 aeroplanes and 2,500 engines per month, and specialist technical personnel would have to be transferred from other work for their manufacture. The *American Programme* was eventually approved and its execution was entrusted to a newly created department (*Flugzeugmeisterei*). The German air service was given priority for all essential raw materials and factory requirements immediately after the submarine service. From the 1st of October 1917, 1,500 machine-guns per month were reserved for aircraft requirements. The monthly allotment of petrol was increased from 6,000 to 12,000 tons. For low-flying attacks the so-called protection Flights were reorganized as battle Flights (*Schlachtaffeln*). No provision for an increase in these seems to have been incorporated in the *American Programme*, possibly because eight were transferred from the Eastern to the Western front. In March 1918 there were thirty-eight battle Flights on the Western front.

Owing to the lack of raw material and to other difficulties, the fulfilment of the *American Programme* was often doubtful throughout the winter of 1917-18 but, in the event, it was completely realized by the 1st of March 1918. So far as concerns fighter Flights, it was, in fact, slightly exceeded as an 81st Fighter Flight, made up of elements from Russia, was in existence on that date. The number of new artillery Flights was reduced from seventeen to seven, but this was a matter of reorganization, not a real reduction. It was found preferable, because of the resultant economy in senior officer personnel and in transport, to increase each existing artillery Flight from six to nine aeroplanes, and the aircraft which would otherwise have gone to the creation of new Flights were so used. How effective the German efforts to speed up the industrial output were may be seen from the figures for aeroplane production. In 1915 German manufacturers had produced 4,400 aircraft, in 1916 naissance 6; artillery 9 (increased from 6); protection (or battle) 6; bombing 6; photographic reconnaissance 9; serio-photographic 4.

8,100, but in 1917, although the *American Programme* only began to take effect towards the end of the year, the figure had jumped to 19,400.

Apart from this intense expansion activity, there was continuous study, throughout the winter of 1917-18, of the tactical employment of the air arm in offensive operations. Experienced flying officers were called back from the front to the German Air Service head-quarters, from time to time, and worked out exercises in the form of War Games (*Kriegsspiele*). Every possibility, so far as it could be foreseen, was considered, and dispositions to meet it were debated and settled. As surprise was essential, it was decided there must be no preliminary abnormal air activity. A great increase of aerodrome accommodation behind the front chosen for the attack could hardly fail to be discovered by the British air observers and, to overcome this difficulty, it was decided to increase the number of fixed hangars evenly along the whole German front, and to erect additional portable hangars behind the battle-front only immediately before the offensive was due to begin. The *Kriegsspiele* exercises clearly demonstrated the need for greater mobility in the Flights. The stalemate of trench warfare had led to Flights becoming over-encumbered with all sorts of superfluous stores. Once they went on the move there would be no transport to take these superfluities. The organization, therefore, was carefully examined and precise instructions issued about what was allowable under conditions of moving warfare. Another clear and definite conclusion was that the fighter and battle Flights must be used at the point where the higher command sought a decision, and the need for a close liaison between these Flights and the army staffs was emphasized. The Flights must be kept continuously informed, if their intervention was to have the maximum effect, of the progress of the battle, but could not be expected to plan their own operations. It was the duty of the army staffs concerned to give the Flight commanders specific orders according to the changing needs of the battle.¹

¹ The *American Programme* and the growth of the German air offensive plans are dealt with in an important section in *Deutschlands Krieg in der*

Air Operations before the battle

The memorandum on the employment of the Royal Flying Corps in defence, already referred to (Appendix XIV), stated: '... As soon as it has been established that 'preparations for an attack are in progress behind the 'enemy's line, the next duty of the Royal Flying Corps is 'to interfere with them. The means available are:

- (a) Co-operation with our artillery, the activity of which will probably be increased at this stage.
- (b) Extensive bombing attacks, to hinder the enemy's preparations, inflict casualties upon his troops and disturb their rest.
- (c) An energetic offensive against the enemy's aviation in order to permit of (a) and (b).'

The fact that the enemy was to attack on the Third and Fifth Army fronts was accepted, we have seen, at the beginning of March, and the Royal Flying Corps 'duty of interference with the enemy preparations', began, therefore, in the first week of March. The aircraft co-operation with the artillery was of the first importance. Schemes for the employment of the artillery in defence had been drawn up at the end of December 1917 and were afterwards elaborated from time to time. The task of the artillery before the enemy began his attack was counter-battery work, harassing fire generally, and the registration of the main enemy ammunition and supply rail-heads, detraining stations, main and light-railway lines, canal bridges, likely assembly points, and the roads and paths to the battle zones. Air photographs, especially of the counter-battery area, formed the basis for the building up of the artillery programmes, and the Corps squadrons were almost

Luft (Hoeppner, pp. 139-52). Information about the allotment of aircraft to German armies, corps, and divisions, about the organization of the air units and about their duties, &c., is given in *Luftstreitkräfte*, by Oberst a. D. Jochim. This is a pamphlet in the German series on the tactical experiences of 1914-18, and is in the section, *Grundsätze für die Einzelwaffen*, of the part dealing with the preparations for the offensive in France in the spring of 1918, *Die Vorbereitung des deutschen Heeres für die grosse Schlacht in Frankreich im Frühjahr 1918*. The student will find this pamphlet of value. The publishers are Mittler & Sohn, Berlin.

exclusively occupied, before the offensive, in helping the artillery. In this work, also, the kite-balloon sections, although hampered by the weather conditions, played a part. Great numbers of German batteries were engaged for destruction, and the reports of the aeroplane and balloon observers, before the battle opened, make frequent reference to fires and explosions in enemy gun-pits.

The day-to-day work of the Corps squadrons in their task of helping the artillery and of keeping a close watch on the German defence systems had little in it that was spectacular. Statistics of hours flown, of batteries engaged and destroyed or silenced, of wire, trenches, strong-points, and dumps, battered, of photographs taken and retaken, might appear impressive, but would convey little idea to the general reader of the patient and arduous work, under fire from anti-aircraft guns, often from rifle and machine-guns, and not infrequently from more formidable fighting aircraft, of the pilots and observers of the Corps squadrons. Of all the air service personnel, they were in closest continuous touch with the battle-field. It has been made clear throughout this history, but may be repeated, that air fighting, which became more strenuous and more important as the war progressed, was not an end in itself. It was a struggle continuously waged to make it possible for the Corps squadrons, and for the other squadrons engaged in the duties of co-operation with the army, to fly about their allotted tasks with a measure of freedom from attack by enemy fighting pilots.

While his troops were massing for the battle, the enemy was, deliberately, not very active in the air, and, although there was much desultory fighting and, occasionally, a clash between large formations, many of the Royal Flying Corps offensive patrols passed without particular incident.

The main offensive against the enemy air service, therefore, before the battle opened, took the form of attacks on the German aerodromes. Coupled with these was the attempt, by 'extensive bombing attacks, to hinder the 'enemy's preparations, inflict casualties upon his troops 'and disturb their rest'.

Instructions issued for guidance by the Chief of the

General Staff to all Armies and to the Royal Flying Corps on the 16th of February, stated:

- (i) Spasmodic bombing is wasteful. Bombing should be concentrated as regards time, though not necessarily as regards area. If, for example, the policy is to lower German morale, hutments or billets should be bombed as continuously as the weather permits, especially by night. The effect on morale of a succession of bombing attacks on hutments or billets at short intervals is much greater than that of the same number of raids spread out over a longer interval, interspersed with raids on other targets.
- (ii) Attempts to interrupt railway traffic should not be made until operations are in progress, as the effect of an interruption of traffic is then much greater.
- (iii) Ammunition dumps are unsatisfactory targets except when they are large and easily approached.
- (iv) Head-quarters (except during a battle), supply, and pioneer dumps are unsuitable targets.
- (v) Concentrations of rolling-stock and repair-shops are particularly suitable targets, as the Germans are known to be short both of rolling-stock and high-speed machine-tools.
- (vi) Army aviation parks are also suitable targets as they correspond to our aircraft and aeroplane supply depots and a great deal of work is concentrated in them.
- (vii) Large depot camps and training centres are suitable targets, but it is understood that these are beyond the range of our present night-bombing machines.
- (viii) Factories are also suitable targets.

The main bombing began about the 7th of March when the air concentration in the Third and Fifth Army areas took place. It will be recalled that No. 101 (F.E.2b) night-bombing Squadron had been moved to the Fifth Army area on the 16th of February to attack German aerodromes from which pilots set out to bomb Paris and the

lines of communication of the Third and Fifth Armies. Actually the squadron was given a wide choice of objectives to meet different conditions of weather, but it also had orders that attacks were to be concentrated, that is, attacks on a particular target, once begun, were to be continued for several nights. When the weather was favourable, distant objectives were to be bombed. These were listed as of three grades of importance: in the first were five aerodromes and two railway stations (Hirson and Petit Maubeuge), in the second, three aerodromes and three stations (Le Cateau, Bavai, and Landrecies), and, in the third, eight billeting and depot villages. For nights when the conditions were not good enough for distant work, objectives within the Fifth and Third Army reconnaissance areas, chiefly rest billets, railway junctions, and dumps, were to be bombed in accordance with lists of targets supplied by the staffs of the two Armies.¹

The first attack of No. 101 Squadron from the Fifth Army area was made on the night of the 16th of February when the German aerodrome at Vivaise was bombed by four F.E.2b's. The village of Bohain was the next target and was twice bombed in the night of the 19th. The squadron was then ordered to begin its attacks on Etreux aerodrome which housed the German night-bombing units responsible for the raids on Paris and on the British lines of communication. The attacks were ordered to take place from the 20th of February to the 4th of March, but, during this period, the weather was favourable for the operation on the night of the 21st of February only. At 5.20 p.m. fifteen F.E.2b's of the squadron set out, not in formation, but individually. All pilots found the objective without difficulty, and reported that it was well protected by anti-aircraft guns. Thirteen hits on the aerodrome buildings were claimed, mostly with bombs of 25-lb. weight: only two bombs of heavier weight (112-lb.) were carried. The same pilots returned to the attack at 10.35 p.m. and, although the visibility was not good, again reported direct hits; they also fired 4,400

¹ That is, the Third and Fifth. The Third Army had, at the time, no night-bombing squadron.

rounds of machine-gun ammunition against hangars and searchlights on the aerodrome. A total of two 112-lb. and three hundred 25-lb. bombs were dropped.

On the 24th of February the squadron attacked alternative short-distance objectives at Montbrehain, and, on the 25th, rest billets in the woods east of Fontaine-Uterte.¹ The raid on the rest billets was continuous, all pilots making two or more trips, and 378 bombs of 25-lb. with twelve of 40-lb. weight were dropped. During the attack on the aerodrome at Etreux on the night of the 21st/22nd of February, it was seen that the aerodrome at Seboncourt was lighted up. On the night of the 5th of March, therefore, Seboncourt was attacked by fourteen pilots of the squadron, but the visibility was poor and the results unobserved. From the 6th of March to the night before the German offensive opened on the 21st, night-flying operations were possible on seven nights when the objectives were chiefly railway communications in the Le Cateau-Busigny area (where air reconnaissances had reported great train movements), and ammunition dumps at Fresnoy-le-Grand, Brancourt-le-Grand, and Prémont. On the night of the 18th of March the main objective was Etreux aerodrome which was attacked over a period of seven hours by ten pilots, each of whom made two journeys. Bombs were also distributed on the dumps at Bohain and Fresnoy-le-Grand, and on Seboncourt aerodrome.

The Fifth Army, unlike the other Armies along the front, had no day-bombing squadron until the arrival of No. 5 (Naval) D.H.4 Squadron from Dunkirk on the 6th of March.² The squadron began bombing operations next day, the objective being the German aerodrome at Mont d'Origny which had been reported active by night-

¹ A document captured on the 19th of February revealed that the rest billets at Fontaine-Uterte were occupied by the 352nd Regiment from the Russian front.

² In anticipation of the amalgamation of the Royal Flying Corps and Royal Naval Air Service into the Royal Air Force, which took effect on the 1st of April 1918, the naval bombing squadrons (except No. 17) and five of the seven fighter squadrons at Dunkirk were placed under the orders of Sir Douglas Haig on the 3rd of March. Only No. 5 (Naval) Squadron, however, was moved before the German offensive began.

bombing pilots on the 5th. Thence to the 21st of March, the main objectives of No. 5 (Naval) Squadron were the aerodromes and dumps at Etreux, Busigny, and Bohain, and other targets attacked were the aerodrome at Mont d'Origny, the ammunition dump at Prémont, the canal bridges at St. Quentin, and railway sidings at Guise.

The bombing programme for No. 102 (F.E.2b) Squadron, which had arrived at Le Hameau in the Third Army area on the 5th of March, was supplied by Royal Flying Corps head-quarters and was similar in kind to that given to the Fifth Army's night-bombing squadron. For distant work, when the weather was suitable, a list of targets of three grades of importance was included. The chief were the rolling-stock and engine depots of Mons (where ammunition could usually be expected to be lying in trucks in the sidings), of Aulnoye (where there was, in addition, a large factory housing ammunition and other supplies) and of Ath (where there were also repair-shops and an ammunition depot), and five specified aerodromes. Of secondary importance were the rolling-stock and ammunition centres at Maubeuge, Hautmont, and Tournai, an ammunition depot at Attre, and four aerodromes. Of tertiary importance were railway and ammunition depots at Braine-le-Comte and Luttre, ammunition depots at St. Amand and Le Maroc, and six aerodromes. A list of short-distance bombing targets supplied by the Third Army staff, for attention when the weather conditions were against more distant work, contained the names of four Group Head-quarters, ten Divisional Head-quarters, twenty-three rest-billet centres, and sixteen railway junctions and dumps. Again it was stated that a target, once bombed, was to be attacked several nights in succession. Nos. 101 and 102 Squadrons were to keep each other informed daily of the specific targets chosen for attack.

On the five nights during which attacks were made by No. 102 Squadron before the battle opened, the bombing operations, except for one raid on Emerchicourt aerodrome, were confined to billeting villages and hutments opposite the Third Army front, a total of 1,404 bombs of 25-lb. weight being dropped over this period.

The day-bomber squadron—No. 49 (D.H.4)—attached to the Third Army was chiefly employed throughout February and down to the 10th of March on photographic reconnaissances of specified areas opposite the Third Army front, but from the 11th of March onwards bombing attacks were made on most days on billeting villages and ammunition dumps, the targets being some of those attacked by the Third Army's night-bombing squadron.

Down to the beginning of March the two day-bomber squadrons (Nos. 25 and 27) of the head-quarters Ninth Wing had for objectives railway junctions extending from Roulers in the north to Cambrai in the south. But when the squadrons moved to the Fifth Army area on the 6th of March they were given a list of targets of three grades of importance, the chief being Mons, Aulnoye (including the Berlaimont aerodrome), and Hirson. The day-bombers began operations on the 8th of March when No. 27 Squadron attacked Busigny railway junction. Up to the 10th of March No. 25 Squadron was employed on photographic reconnaissances, but on that day opened its bombing with an attack on Cambrai station. Thence to the 20th of March, except on three days, there were attacks on the railway junctions at Mons, Aulnoye, Hirson, Denain, Busigny, Somain, Bohain, and Bavai, on the aerodromes at Etreux and at Saultain (Valenciennes), and on the dump at Beaudignies, seven miles south of Valenciennes.

It may be generally observed that although spasmodic bombing had been declared to be wasteful of effort, and squadrons had been ordered to concentrate their attacks, they were given such a wide choice of targets as to make some dissipation of effort difficult to avoid. There was some concentration against the aerodrome at Etreux and against Busigny railway junction, but, apart from this, the bombing was distributed over a large number of widely separated objectives. Also, there was no attempt to transfer to the threatened British front the bombing squadrons which were operating from the neighbourhood of Nancy. It will be recalled that these squadrons had been detached in October 1917, on the orders of the

British Government, for attacks on German objectives as a counter to the raids by German aircraft on England. While the enemy preparations for the 1918 offensive were being made, these bombing squadrons continued their raids on such objectives as Mannheim, Mainz, Kaiserslautern, and Zweibrücken. It is true that, although the probability of an attack on the British Third and Fifth Armies had been accepted early in March, the magnitude of that attack, when it was launched on the 21st, came as a surprise, but even when disaster threatened, the independent bombing squadrons were not moved to the Amiens sector. On the 28th of March, however, on the representations of General de Castelnau, commanding the French Eastern Group of Armies, the two night-bombing squadrons at Nancy were placed under his orders for attacks on the enemy railway communications in the Châlons-sur-Marne sector where a German offensive seemed to threaten. The two squadrons (Nos. 100 and 216) were transferred on the 1st of April to an aerodrome at Villeseneux in the French zone and their objectives were the stations and sidings at Juniville, Chaulnes, Roye, Amagne-Lucquy, Mohon, and Asfeld.¹

Meanwhile, as part of the offensive against the German air service on the threatened front, there had been organized combined bombing attacks on aerodromes. The first of these took place on the 9th of March when the targets were the aerodromes at Busigny, Bertry, and Escaufourt. The operation had been planned some time before and the pilots of the attacking squadrons had been given practice in bomb dropping from low heights. About 1.30 p.m. on the 9th fifty-three pilots crossed the lines to deliver their attack before the German aircraft rose for their afternoon patrols. The squadrons were led by their commanders, with the Wing Commander flying above the combined formations. No. 23 Squadron, supported by No. 24 Squadron, attacked Bertry aerodrome, while Nos.

¹ The squadrons remained under French orders in this area until the 9th of May, but owing to bad weather conditions made attacks during this period on six nights only, dropping eleven tons of bombs on their allotted objectives.

48 and 54 Squadrons, covered by the pilots of No. 84 Squadron, bombed Busigny and Escaufourt. A total of eighty-eight bombs were dropped and direct hits were reported on the hangars and buildings at each of these aerodromes. All the aircraft returned safely at low heights after making attacks with their machine-guns on various targets on the homeward journey.

On the 17th of March a combined large-scale bombing operation was again attempted, but the main object of the bombing on this occasion was to induce the enemy pilots to take the air where they would be subject to a surprise attack, down sun, by fighting formations. At 10.30 a.m. on the 17th five D.H.4 pilots of No. 5 (Naval) Squadron attacked Busigny aerodrome, dump, and railway station. Flying well off, up sun, was a formation of fourteen S.E.5's of No. 84 Squadron with orders to dive in rear of the bombers, immediately the D.H.4's were clear of their objective, and attack any enemy aircraft in the area. The operation led to heavy fighting over Busigny as a result of which three aircraft of a large German formation were destroyed. Next day, the 18th, the scheme was attempted again, but this time the aerodrome at Busigny was the sole objective and No. 54 ('Camel') Squadron was added to increase the fighting strength. Nine D.H.4 pilots of No. 5 (Naval) Squadron delivered their attack from 16,000 feet, with No. 84 Squadron, operating in three Flights, and No. 54 Squadron in two Flights (a total of twenty-four fighters), coming up in support. The two fighter squadrons arrived, as planned, just when the enemy aircraft were converging to attack the bombers. It was estimated that the mixed groups of German triplanes, Albatros D.III's, and Pfalz Scouts, which took part in the fight numbered about fifty, including Richthofen's 'Circus' of thirty. A series of relentless combats ensued which drifted east of Busigny and ended at Le Cateau after taking many of the pilots almost to ground level. The casualties were high: five 'Camels', two S.E.5's and one D.H.4 were shot down in the German lines, and one D.H.4 which was brought back by its wounded pilot was badly damaged. Four of the German aircraft were seen to crash.

The bombing was added to generally by the Armstrong-Whitworths and R.E.8's of the Corps squadrons which dropped bombs, incidentally, when engaged in their normal routine of artillery co-operation and close reconnaissance. There was, also, by these squadrons, a fair amount of night bombing and an occasional combined raid.¹ Not much of this bombing, however, could be done on the threatened fronts of the Third and Fifth Armies where the Corps squadrons were kept fully occupied by day on their work of co-operation.

'The successful performance of the role of the Royal 'Flying Corps in defence', said the memorandum already referred to (Appendix XIV), 'must primarily depend on its 'ability to gain and maintain the ascendancy in the air. 'This can only be done by attacking and defeating the 'enemy's air forces.' There had, throughout the winter of 1917-18, been much discussion about the best type of fighting formation. In a memorandum issued by Royal Flying Corps head-quarters in December 1917,² it had been suggested that a squadron formation made up of three sub-formations—each consisting of six aeroplanes under the leadership of a flight commander—might be most effective. The whole would be directly led by the squadron commander, but this increased grouping, it was stated, would not be possible until the strength of the fighter squadrons had been raised from eighteen to twenty-four aeroplanes to allow for a margin of temporarily unserviceable aircraft. It was stated also to be fairly certain that when the number of fighter squadrons in the field had grown, it could be expected that two or three squadron formations would co-operate to form a still greater striking force.

¹ A letter addressed to armies by the Chief of the General Staff, General Head-quarters, on the 19th of January 1918, said: '... Until such time as the 'number of regular night-bombing squadrons is increased, Corps squadrons 'should be employed as required against suitable targets within their range, 'under arrangements to be made by armies. The machines of Corps 'squadrons are capable of carrying approximately the same weight of bombs 'as the regular night-bombing machines, and are suitable for night flying. 'This means of supplementing our resources has been adopted in certain 'armies but it is capable of further development...' ² See Appendix XVII.

There was much difference of opinion among commanders of fighting squadrons about the size of the sub-formation, but there was some agreement that six aeroplanes were too many for cohesion and close control by one leader. Many favoured a sub-formation of three, and it was eventually made clear to the brigade commanders that they had full discretion to organize their patrols as they thought best, except that a sub-formation must not exceed the limit of one Flight. Actually, most of the fighting squadrons worked in three sub-formations of five aeroplanes. For the first time in the war, the commander of the fighting squadron here emerges as a leader of his squadron in the air. His duties, hitherto, had been chiefly administrative and his influence on the morale of the squadron had to be exerted from his chair in the squadron office rather than from the seat of an aeroplane. It had been approved, in January 1918, that, in the fighting squadrons, an additional aeroplane should be added to the agreed establishment of eighteen for the use of the squadron commander. Early in February this establishment was raised to twenty-four aeroplanes with a consequent increase of pilots from twenty to twenty-seven. As 'Camel' (Clerget) aeroplanes were immediately available, it was decided to raise six 'Camel' squadrons to the higher establishments at once, but there ensued a little delay because of an insufficiency of trained pilots. By the 21st of March 1918 seven 'Camel' squadrons had been made up to an establishment of twenty-four aeroplanes, plus one for the squadron commander; four of these squadrons were along the front of the Third Army, and one was with each of the other three armies.

For some weeks before the German offensive opened air patrols were maintained opposite the Third and Fifth Army fronts. On the front of the Third Army 'close' and 'distant' patrols were kept up by the squadrons of the Thirteenth (Army) Wing of the III Brigade. Close patrols were of the area between the front-line trenches and a line running north and south about five miles on the enemy side. Distant patrols covered the area between the outer limit of the close patrols and a line about nine miles

farther east. The squadrons on the distant patrols had two Flights working at a time, and when bombing operations or photographic reconnaissances were made, the patrols were timed and positioned in close co-operation with the bombing or photographic formations. Up to the 16th of March the 'close' patrols were made by a formation of one Flight, but after that date two Flights became common.

When the Fifth Army had begun the extension southwards by taking over part of the front of the Third Army on the 18th of December 1917, the attached V Brigade of the Royal Flying Corps had only two Corps squadrons and two Army squadrons (48 and 54). For a time No. 48 (Bristol Fighter) Squadron did long reconnaissance and photographic work, usually by single aeroplanes, and inner offensive patrols, usually by four or five aeroplanes. At the end of December 1917 the Army Wing (Twenty-second) was strengthened by Nos. 24 and 84 Squadrons which at first sent out aeroplanes to patrol in pairs to keep the Fifth Army front clear of enemy aircraft up to the line Lesdain-Villers-Outreaux-Beaurevoir-Ramicourt-Sequehart. From the beginning of January 1918, however, the orders were for all aircraft to operate by Flights, and the patrol line for the Fifth Army fighters was extended southwards, first to Ribemont, and then to just south of Barisis when the taking over from the French was completed. Long reconnaissances continued to be a duty of No. 48 Squadron which also provided offensive patrols.

When the squadrons of the head-quarters Ninth Wing moved south to the Fifth Army sector on the 7th of March, the fighters were given an offensive-patrol area stretching roughly from Cambrai to Le Catelet. The boundary between the Third and Fifth Armies was eight miles south of Cambrai and four miles north of Le Catelet so that the Ninth Wing offensive patrols covered a part of both army fronts. When bombing formations of Nos. 25 and 27 Squadrons were operating, the times and routes for the fighter patrols were closely co-ordinated with those followed by the bombers.

Because they were operating over the central area of the

line to be attacked by the enemy on the 21st of March, the offensive-patrol formations of the head-quarters fighting squadrons, as might be expected, had some big encounters, more particularly with formations led by Richthofen. On the 12th of March nine Bristol Fighters of No. 62 Squadron, while on offensive patrol between Cambrai and Villers-Outreaux, fought Richthofen's 'Circus' of Fokker triplanes and Albatros Scouts. Four of the Bristols were shot down (one by Richthofen, his sixty-fourth victory), while two of the enemy fighters were destroyed.

The same squadron was again in action with Richthofen next morning. On this occasion they were co-operating with a bombing attack on Denain by Nos. 25 and 27 Squadrons. Eleven Bristols of No. 62 had been ordered to patrol the line Cambrai-Le Cateau, while two Flights of 'Camels' of No. 73 Squadron were given the line Cambrai-Villers-Outreaux. Richthofen was in the air with about thirty-five Fokker triplanes and Albatros Scouts, and he promptly took the chance offered him to attack the British formations separately. The 'Camels' were attacked first and two of them were shot down, one in flames by Richthofen himself, but in the rapid fight an Albatros and a Fokker were also destroyed. Richthofen did not pursue the fight with the 'Camels' but passed on and, within a few minutes, met the Bristols of No. 62 Squadron. The leader of the Bristol Fighters, seeing that he was outnumbered, tried to avoid combat, but at the same time endeavoured to entice Richthofen from the line of the bombers. He did, in fact, lead the German formation away for a considerable distance and might have got back to the lines without fighting except for a misunderstanding. A manœuvre by a pilot in the lower Flight of Bristols was misread as a signal for a diving attack on a group of Fokker triplanes, and a general dog-fight ensued. The Bristols were well handled, and the leader, Captain G. F. Hughes (observer Captain H. Claye), destroyed two Fokker triplanes, while many other enemy fighters were sent down apparently out of control: two of the Bristol Fighters were lost. It would seem that in one or other of these two fights, the younger Richthofen—Lothar—was one of those shot

down out of control: he crashed badly, but recovered from his injuries after several weeks in hospital.

The Offensive begins

[Maps, pp. 267 and 364]

The specific duties of the Royal Flying Corps squadrons, once the German offensive opened, had been defined in a series of schemes which were displayed, with maps, in the observer huts in each squadron. All ranks concerned had orders to master the various schemes and to watch the changes on the maps which were kept up to date as new information was revealed by air photography or from other sources.

In the Fifth Army Area the detailed schemes had first been circulated by the V Brigade commander in the middle of January. The general instructions stated:

- (a) The Corps machines will not be affected except that surplus energy after the day operations will be directed towards night bombing behind the enemy lines on a prepared plan.¹
- (b) The duties of the Army squadrons in order of importance are:
 - (i) Preventing interference with our Corps machines.
 - (ii) Attack of detraining points, debussing centres, active-battery positions, and troops and transport on roads with a view to hampering the enemy's reinforcements and prevent him pressing home the full weight of his attacks.
 - (iii) Attack of the enemy front-line troops by low-flying machines.
 - (iv) Patrols flying high over the area of operations in order to enable the Army machines to carry out their missions.

¹ Corps squadrons had general orders, when the offensive began, to concentrate on: (i) counter-battery work; (ii) artillery patrols; (iii) counter-attack patrols; (iv) counter-battery photography; (v) harassing of enemy troops and transport with machine-gun fire and bombs; and (vi) night bombing.

- (c) The changing personnel and the varying state of serviceability of machines in a Flight will render it impracticable to detail particular Flights to particular duties in accordance with each scheme; the above, however, does not apply to squadrons who will be detailed beforehand to their particular role, the Commanding Officers being responsible for the apportionment of the work within their unit.
- (d) (i) The 'Camels' will undertake the responsibility for ensuring continuance of work on the part of our Corps machines.
- (ii) The Bristol Fighters are the most suitable machines for the low-flying work in accordance with sections (ii) and (iii) of sub. para. (b) above.
- (iii) The S.E.5's will patrol the area of operations for the purpose of attacking hostile formations.

Following these general instructions detailed orders had been issued, on the 18th of January, by the Officer Commanding the Twenty-second Wing. The 'Camel' squadron—No. 54—by close escort and inner protective patrols, was to be responsible for the direct protection of the Corps squadrons; No. 48 (Bristol Fighter) Squadron was to keep two Flights available for attacking specified ground targets, and the third Flight was to be ready for long-distance reconnaissance; Nos. 24 and 84 Squadrons were to work by Flights, and received the following instructions: 'It is probable that enemy infantry attacks will take place at or just before dawn, and at least one Flight per squadron will be ready to get off immediately there is sufficient light. It will not be possible to lay down the height of patrols, but they will be told to operate over the battle area and must remember that their role is purely offensive, and the enemy must be sought and destroyed throughout the patrol. It is probable that most fighting will take place at below 2,000 feet as the enemy will be endeavouring to co-operate with his own infantry. Patrols will finish their flights normally. All pilots will carry one drum of Buckingham, and all enemy balloons in the battle area must be destroyed or kept down.' A later amendment

stated that Nos. 23 and 24 Squadrons would 'be held as a 'reserve to reinforce; they may be employed on any of 'the roles mentioned therein'.

The instructions to the squadrons operating with the Third Army were similar in kind. Low-flying 'Camels' of Nos. 3 and 46 Squadrons were to operate between the Scarpe and the southern boundary of the army front; close offensive patrols of the Bristol Fighter and S.E.5 Squadrons, starting at dawn, were to work in conjunction with the low-flying 'Camels', while distant offensive patrols by the same two squadrons, each two Flights strong, were ordered.

The low-flying pilots were fully informed of the specific targets they were to attack. The whole front was parcelled out to ensure the maximum effect from the limited aircraft available, and every pilot knew exactly what his duty would be, and was given full opportunity, before the offensive opened, to become acquainted with the ground.

Such were the plans, comprehensive and detailed, but the weather made them impossible of application. On the 19th of March, after a long dry spell, there was rain, with the result that a heavy mist spread over the battle-field. With the coming of night on the 20th the mist thickened and gave the illusion that it muffled sound, for the German artillery fire had ceased. The unusual silence was oppressive, and, with the fog, combined to produce an atmosphere of the macabre.

21 March At 4.45 a.m. on the 21st of March, out of the mist, the crash came. Forward and battle zones, battery positions, lines of communications, head-quarters, and back areas to a depth of twenty miles or more, were suddenly deluged with shells, many of them gas, and although the bombardment was fiercest about the two centre Corps of the Third Army and in the Fifth Army area, it was heavy also north of Arras, at Messines and Ypres, and against the French at Rheims. And massed along the fifty-four miles of front between the Sensée and the Oise rivers, ready and waiting to be launched against the British, were fifty-six German divisions, with twelve more divisions behind them to be thrown in as the battle developed.

Opposed to this vast array were the four centre divisions of the Third Army with three in reserve, and eleven divisions along the front of the Fifth Army with three other divisions and three cavalry divisions in reserve. It should be noted that the Germans attacked the whole front of the Fifth Army, but only a part of the Third Army, which had a total of eight divisions in the line with seven more in reserve. The excepted front on the Third Army was the Flesquières salient which the enemy hoped to 'pinch out' by attacks on either side.

The German infantry moved forward to the assault at different times in different sectors from about 8 a.m. onwards, but by 10 a.m. the advance had become general. As at Cambrai in November of the previous year, the outpost line of machine-guns was blanketed by the fog, and none of the elaborate schemes of cross-fire, designed to check the advance, could be put into operation. Few of the outpost troops, especially along the Fifth Army front, knew what was happening until the enemy infantry were in their rear. Soon after the attack began the German troops were fighting in the forward zone, and, before noon, they had penetrated to the Fifth Army's battle zone. The first that many of the battery detachments in the forward area knew of the attack was when German infantry appeared suddenly out of the fog a hundred yards or so away. Not many of the light signals which had gone up along the outpost and forward line of the Fifth Army had been seen, telephonic communications had been severed by the German bombardment, and there was little coming down from the air.

Along the greater part of the front, the squadron flying officers, who had gone out in spite of the fog, could see little of what was happening. There were, however, exceptions. On the Third Army front the visibility in the Lagnicourt area would appear to have been better in the morning than elsewhere, because the pilots and observers of No. 59 (R.E.8) Squadron reported much of what was happening there. One observer of this squadron, who had gone up to reconnoitre at 6.15 a.m., was able to follow the bombardment along the whole front of the IV Corps, and reported that the line and

21 March wire were heavily damaged, particularly at Lagnicourt: the flight was cut short at 7.45 a.m. by a shell which crashed through the fuselage of the aeroplane and severed some of the controls. Up to noon, six other aeroplanes of this squadron made patrols over the battle area, and the observers sent down to the British artillery many wireless calls, some of which were answered, for fire on active German batteries. From one observer (Lieutenant J. E. Hanning; pilot, Second Lieutenant C. E. Williamson-Jones) of the squadron there came down, between 11.10 a.m. and 2.20 p.m., a stream of wireless messages calling for fire on specified German batteries and on large bodies of infantry massed in sunken roads, and pouring down the roads from Quéant and Pronville, but in no instance did the observer see an answer to his calls from the British guns: on the homeward journey messages giving the positions of the massed enemy troops were dropped on the Corps head-quarters. An air reconnaissance, made by Captain D. H. Oliver and Second Lieutenant W. H. Leighton between 2.50 p.m. and 3.50 p.m., when the visibility had greatly improved, followed the whole front of the German advance in this area and revealed that between Bullecourt and Doignies a deep bite had been made into the Third Army front. Louveral, Lagnicourt, Noreuil, and Bullecourt were in enemy hands, and German infantry had penetrated to the British trenches north-east of Vaulx-Vraucourt. Just before this observation was made, another observer of No. 59 Squadron had had the satisfaction of seeing an immediate response to a call for fire on large bodies of German infantry advancing in the open west of Lagnicourt, the British shells falling among the enemy troops with devastating effect. The last aeroplane of No. 59 Squadron left the lines soon after 7 p.m., by which time mist had once again shrouded the battle-field. The squadron's reports, obtained under conditions of much difficulty, had given a fairly comprehensive picture of the German advance, which, along seven miles of the front, between Doignies and Bullecourt, had taken the enemy into the British forward zone to an average depth of about 3,000 yards. The extent of the German

advance immediately west of Bullecourt was followed from *21 March* air reports by No. 12 Squadron (VI Corps) which linked up with the reports made by No. 59 Squadron. Northwards from Bullecourt and southwards from Doignies into the Flesquières salient, the air reports showed that the line of the Third Army was little changed. Low-flying attacks on the Third Army front had begun at 6 a.m., when six 'Camel' pilots of No. 46 Squadron found a group of active batteries north of Bourlon Wood and attacked them with 25-lb. bombs and with machine-gun fire. About 11.30 a.m. five of the same squadron's pilots were in the air again and saw German infantry advancing in force near Lagnicourt with the British troops in retirement to the reserve line. The enemy troops were promptly attacked by the 'Camels' and the pressure on the retiring British infantry was temporarily eased. Four other low-flying patrols were made during the day by formations of this squadron and each time the German troops and batteries were attacked.

Over much of the front of the Fifth Army the fog was denser throughout the morning than it was farther north, and, in places, the air observers could see nothing. But how formidable was the German advance, at least on the right of the Fifth Army, was known from an air report received by the III Corps Commander at 10.40 a.m.—a report which gave him the first disquieting news of the situation south of St. Quentin. The enemy, he learned, was already into the battle zone at the supposedly impregnable section between Essigny-le-Grand and Benay. The observer had seen German troops in occupation of part of Benay, but Hinacourt to the south was still in British possession.

About 1 p.m. the fog lifted enough to make more general observation possible, and observers who went far afield over the German lines came back with news of great troop concentrations on all roads feeding the battle-front. Particularly were they dense backwards to Aubencheul-aux-Bois, behind the front where, at Ronssoy, south of Cambrai, the Germans had, in the morning, bitten deeply into the battle zone.

21 March

Contact-patrol observers, in the afternoon and early evening, were able to keep in touch with the situation along much of the Fifth Army front. On the right at Essignyle-Grand and Benay, little more progress was made: Maissemy, north-west of St. Quentin, however, had fallen, but Le Verguier, in the forward zone farther north, was holding out. Templeux-le-Guérard had gone. The observers called for fire on many of the German concentrations and batteries, and their signals were often answered. Their work was punctuated by attacks on German contact-patrol aeroplanes, and by machine-gun and bomb attacks on German troops and guns.

Special low-flying attacks, on the Fifth Army front, were made in the afternoon by Nos. 84 (S.E.5), 24 (S.E.5), and 23 (Spad) Squadrons. The pilots carried bombs of 25-lb. weight and attacked such suitable targets as they found. The swiftly changing military situation, combined with the poor visibility, made these attacks of a spasmodic kind. No. 53 (R.E.8) Squadron, unattached to any active Corps,¹ was employed, from 1.20 p.m. onwards, on line patrols along the whole Fifth Army front, but its chief work was the bombing and machine-gunning of German troops.

The organized bombing was begun as soon as the weather made this possible in the afternoon. At 9.30 a.m. on the 21st of March Royal Flying Corps headquarters had ordered attacks on the railway junctions at Le Cateau, Busigny, and Wassigny. Wassigny was attacked at 3.45 p.m. by nine D.H.4's of No. 25 Squadron: nine 112-lb. and forty 25-lb. bombs were dropped from 15,000 feet and a few hits were claimed on the railway. About the same time Le Cateau was bombed by seven D.H.4's of No. 27 Squadron from 14,000 feet and, it was claimed, the majority of the six 112-lb. and thirty-two 25-lb. bombs hit the railway track. Two aircraft only, of the same squadron, attacked Busigny

¹ No. 53 Squadron had moved to Villeselve, near Noyon, at the end of February, for attachment to the IX Corps if and when that Corps took over a stretch of line from the French near Soissons. The German attack came before the line could be taken over.

from 13,500 feet, but the fall of the bombs was unobserved *21 March* owing to mist.

In the Fifth Army area No. 5 (Naval) Squadron twice attacked bridges over the St. Quentin Canal, with ten D.H.4's about 2.30 p.m. and with eight at 6 p.m.¹ The bridges attacked were at Honnecourt, Vendhuile, and Le Catelet. A total of two hundred 25-lb. bombs were dropped, but none of the bridges was broken: troops and transport near the bridges suffered some direct hits. Once again the bombing was done from about 15,000 feet, the usual height for day-bombing by the de Havilland 4's. The object of the routine day-bombing by D.H.4's was moral effect rather than destruction, but, on the 21st of March, what was to be the decisive offensive of the war had begun, and the destruction of vital railway junctions or bridges could only have been achieved, if at all, by attacks made from very low heights, say under 1,000 feet. The risks to the attacking aircraft may have been high, but in no other way could the desired results have been looked for with any certainty, and, in the circumstances, it might have been expected that the existing orders that D.H.4's were not to bomb at heights below 15,000 feet would have been suspended. These orders had been issued in August 1917 because the rate of supply of this important aeroplane was slow and it was essential to keep the wastage as low as possible.

Air fighting throughout the afternoon and evening of the 21st of March was intense and confused. Great numbers of German aeroplanes were flying low over the front on contact-patrol work and otherwise co-operating with the German infantry, while fighting formations flew about 2,000 feet with higher layers at 7,000 feet. The Army squadrons on the front of the Fifth Army were involved in

¹ No. 5 (Naval) Squadron were shelled out of their aerodrome at Mons-en-Chaussée in the morning and had to move back hurriedly to Champien. The hangars and buildings at Mons-en-Chaussée were burnt. 'The last message received before the office was hit by a shell and the telephone rendered useless,' said the Squadron Commander, S. J. Goble, '... showed how the Staff could carry on under any circumstances. The message related to the plans for providing vegetables in view of the shortage, and instructed me to prepare frames at once for the planting of seedlings.'

21 March much fighting, chiefly of an indecisive kind. Nos. 24 and 84 (S.E.5), No. 23 (Spad), No. 48 (Bristol Fighter) and No. 54 ('Camel') Squadrons attacked ground targets from low heights and made offensive patrols along the Army front at about 2,000 feet. The patrols, however, did not prevent many attacks being made on the four Corps squadrons¹ working for the Fifth Army, and all suffered casualties. Two pilots were wounded, one pilot and observer missing, three aeroplanes wrecked after combat, and three others were so shot about that they had to be returned to depot for reconstruction. These casualties compare with one pilot and one observer wounded in the Army squadrons, two aircraft wrecked, and one returned to depot.²

On the Third Army front the air fighting, probably owing to the better general visibility throughout the day, was more intense. Offensive patrols began at 10 a.m. and continued intermittently till dusk. The biggest clash of the day was over Bourlon Wood about 1.30 p.m. and involved two S.E.5 formations of No. 56 Squadron, two S.E.5's of No. 64, and three enemy formations totalling twenty-six aeroplanes. Four hostile aeroplanes were shot down out of control, but all other combats were indecisive. An offensive patrol of No. 11 Squadron in the afternoon destroyed two German two-seater aeroplanes.

Special instructions issued to the head-quarters fighting squadrons at 9.30 a.m. on the morning of the 21st were for offensive patrols between Cambrai and Le Catelet and as far south as Lesdins to give additional protection along the Third and Fifth Army fronts and to assist the bombing operations by Nos. 25 and 27 Squadrons. Five offensive patrols were made in the afternoon and evening, but little fighting resulted. Two enemy aeroplanes of a formation of ten Fokker triplanes and Albatros Scouts were destroyed by Bristol Fighters of No. 62 Squadron, but the only loss

¹ Nos. 52, 8, 35, and 82.

² On the Third Army front the casualties to the Corps squadrons were due, with one exception, to rifle or machine-gun fire from the ground. From this cause one aeroplane was wrecked and eight had to be returned to depot. The exception was the aeroplane, already referred to, which was pierced by a shell.

to the squadrons of the Ninth Wing was a 'Camel' of *21 March* No. 80 Squadron shot down into 'No-Mans Land'. The offensive patrols of the fighting squadrons (3 Naval, 2 and 4 Australian Flying Corps, 22, 40, 43, and 18) attached to the First Army, were diverted to cover the Third Army front and had many combats in which four German aeroplanes were destroyed. These squadrons continued for the remainder of the battle to operate mainly over the front of the Third Army.

Published histories of some of the German regiments engaged in the offensive make reference to the work of British aircraft on the 21st of March. The 2nd Bavarian Regiment, near Urvillers, south of St. Quentin, tells how, 'with improving visibility the airmen soon turned 'up and . . . in the most daring manner flew very low 'over the ground and threw bombs causing us considerable losses'. This regiment made progress south of Urvillers and, about 3 p.m., the regimental staff arrived at a sunken road where dug-outs were available for a command post. 'The signal officer, Lieutenant Weisz', says the history, 'had just signalled back to Brigade, and the 'Regimental Adjutant was issuing orders to the subordinate members of the staff who had tentatively taken 'shelter in the sunken road, when a deafening explosion 'robbed us for some moments of consciousness. A hostile 'airman had spotted the concentration and caused his 'blessing in bombs to rain upon us. The signal officer, the 'excellent Weisz, was killed instantaneously. The regimental staff was decimated. The adjutant, Lieutenant 'Hans Zorn, was so badly wounded that he had to be 'relieved.'¹

The German 120th Regiment was ordered forward to Villers-Guislain when it was learned, about 11 a.m., that the German infantry were making little progress in the fighting between Gouzeaucourt and Epéhy. While the regiment was on the move the sun came out. 'To our 'sorrow', says the regimental history, 'British squadrons of

¹ Direct hits on troops packed in the sunken roads south of Urvillers were claimed for three bombs dropped by a reconnaissance aeroplane of No. 82 Squadron. Two hundred machine-gun rounds were also fired.

21 March 'aircraft appeared on the battle-field, while ours were still 'as yet absent', and goes on to tell how the regiment suffered under heavy British artillery fire 'directed with marvellous accuracy by their airmen'.¹ Another regiment, advancing from Honnecourt in the same area, passed 'German artillery which had sixty horses killed by a British 'airman who caught them on the march'.

The German 66th Regiment, which attacked at Maissemy, was held up. British aeroplanes flew over the regiment and their appearance was followed by heavy and accurate shelling. The airmen also bombed and attacked with machine-guns the German positions behind a hill—which was the regiment's immediate objective. The summit of the hill was taken in the early evening, but could not be held owing to violent artillery fire.²

The German 116th Regiment found difficulties in the neighbourhood of Hargicourt, south of Ronssoy. The ammunition began to run out and, as there was no German artillery support, the regiment came more or less to a standstill. A British aeroplane then appeared and, within a few minutes, the hollow in which the regiment was assembled was heavily bombarded, with the result that orders had to be given to fall back.

On the Third Army front, testimony to the work of No. 46 Squadron comes from the history of the 10th Bavarian Regiment. While the II and III battalions were climbing the high ground north-west of Ecoist-St. Mein, preparatory to an attack, 'They got a rotten time. . . . 'About a dozen English low-flying battle aeroplanes 'whizzed up, and from an incredibly low height bombed 'our advancing troops. This caused great confusion, and 'to make matters worse our own artillery frequently fired 'short so that further advance became impossible . . . '

The 73rd Regiment also suffered in the same area. 'The

¹ These troops were reported by observers of No. 8 Squadron.

² Pilots and observers of No. 35 Squadron made many attacks on troops and transport in the Maissemy area where they dropped a total of one hundred and sixteen 25-lb. bombs, and fired hundreds of rounds of ammunition. They also called, by wireless, for fire on fleeting targets of massed infantry and cavalry. One such call, on 1,500 German infantry, was immediately answered by fire which caused great havoc.

'English', it is stated, 'got valuable support from their air- *21 March*
'craft which attacked regardless of consequences. The
'squadrons, flying very low, found profitable targets, for
'bomb and machine-gun, in the thickly concentrated
'masses of the 111th and 2nd Guards Reserve Divisions.
'Our own airmen were absent.'

The German advance on the first day of the battle compelled readjustments of the line, notably on the Fifth Army right where the German bite into the battle zone of the III Corps, in the neighbourhood of Essigny-le-Grand, had created an untenable position. In the afternoon of the 21st the III Corps Commander, after consultation with the Fifth Army Commander, had decided to withdraw during the night to the line of the Crozat Canal. The movement, which began at midnight, was completed without enemy interference, but the German troops followed closely and reached Jussy, on the Canal, soon after 4 a.m. on the 22nd. This movement of the III Corps compelled a bending back of the front of the XVIII Corps on its left to conform. Meanwhile, on the Third Army front, the German advance on the 21st, particularly in the Louveral area, had made hazardous the position of the divisions in the Flesquières salient and, during the night, a limited withdrawal, involving also the left of the Fifth Army, had been successfully accomplished.

It became necessary to move back all squadrons with the Fifth Army, and five squadrons with the Third Army. No. 5 (Naval) Squadron, shelled out of its aerodrome at Mons-en-Chaussée on the 21st had gone to Champien, east of Roye, at once, but the moves of the other squadrons did not take place until the 22nd.

The fog was again dense on the morning of the 22nd *22 March* from dawn to about midday. Fighting on the Third Army front was intense throughout the day in the area of the two Corps north of the Flesquières salient. In the morning German troops broke through the line of unfinished trenches, known as the Green Line, that represented the third defensive system between Vaulx-Vrau-court and Morchies, but local counter-attacks partly restored the situation. In the afternoon, however, there

22 March came the disquieting news that the enemy had penetrated to Vraucourt village. A special air reconnaissance was sent to clear up the situation and, meanwhile, so threatening did it appear that three companies of tanks with infantry in support were ordered to counter-attack. The air report showed that, at 3.30 p.m., the enemy was along the northern outskirts of Vraucourt village which was otherwise in British hands; elsewhere the line was closely observed and noted. While the aeroplane was over the position German infantry were seen advancing to attack east of Vaulx-Vraucourt: they were at once engaged with machine-gun fire from the aeroplane at a height of 700 feet, and forced to lie down. The counter-attack of the tanks and infantry was made with great gallantry, but with heavy losses to the tanks. A contact-patrol observer at 6.30 p.m. watched part of the attack in progress and reported its success. The enemy, it was clear, was being pushed back eastwards of Vaulx-Vraucourt, while south-east of the village the tanks were advancing across the Vaulx-Vraucourt-Morchies road. Elsewhere on the Third Army front the German attacks were, for the most part, held, except at Croisilles and St. Léger where a bite was made into the line.

No. 46 Squadron was the only fighting squadron on the Third Army front used solely for low-flying attacks. Six pilots went out together at 1.30 p.m., five at 4.20 p.m., and five at 5.10 p.m. On each occasion enemy aeroplanes were encountered and combats ensued, but German infantry and transport were bombed and attacked with machine-gun fire.

On the front of the Fifth Army, where the pressure was greatest, the enemy made formidable progress. Observers who flew over the right of the Fifth Army in the early afternoon, continuously harassed by enemy airmen, reported German infantry across the Crozat Canal and Terguier in enemy hands. At 4.50 p.m. German troops were seen in shell-holes at Dury, and the British were reported massing south of the Somme canal between Sommette Eaucourt and Ollezy. On the front of the XIX Corps great pressure was reported in the afternoon down

the Cologne valley with Roisel threatened by German progress at Hervilly and Jeancourt. The situation at Hervilly had been eased by a spirited counter-attack by dismounted cavalry and tanks between noon and 1 p.m., but an air observer over the position at 1.10 p.m. reported the enemy pressing forward again in this area. By sheer weight of numbers the line was forced back from the battle zone and the troops retired, under orders, to the marked-out Green Line of trenches between Villéveque and Boucly. To the north, the air reports showed little change in the line, but in the late afternoon the troops were ordered back to the rear line of defence between Nurlu and Equancourt.

There now developed a critical situation opposite St. Quentin. Stubborn fighting had held the enemy assault between the Cologne and Omignon valleys, but, south of the Omignon, a gap developed between the right of the 50th Division and the left of the 61st Division, and through this gap enemy troops penetrated the so-called Green Line at Vaux and Beauvois. The position between the Cologne and Omignon valleys was thus turned. The last reserves available to the Fifth Army Commander had already been thrown into the battle, counter-attacks to restore the line south of the Omignon were out of the question, and there was nothing to be done but order a retirement to the partly prepared bridgehead positions east of the Somme. At 10.45 p.m. it was ordered that the III Corps should stand fast at the line of the Crozat Canal, the XVIII Corps should fight rear-guard actions back to the Ham defences of the Somme, that the XIX Corps should hold the partly prepared Péronne bridgehead, and that the VII Corps should hold the Green Line.

On the Fifth Army front low-flying attacks with 25-lb. bombs and with machine-guns were made by Nos. 24 and 84 (S.E.5) Squadrons, by No. 35 (Armstrong-Whitworth) Squadron, and, to a less extent, by No. 53 (R.E.8) Squadron which had been given the task of patrolling the front to help protect the Corps aeroplanes. In addition, all Corps squadrons dropped bombs during

22 March their co-operation flights. A total of seven hundred and thirty 25-lb. bombs were dropped by these various squadrons. There is some evidence, from the German side, of the effect of these attacks. The regimental history of the 52nd Regiment, which took part in the attack on Holnon Wood, states that the companies which moved along the south edge of the wood were hit with bombs, and pays tribute to 'the way in which these airmen came down to '20 metres in order to throw their bombs'. Later in the day, German troops near the wood were bombed again, and, according to prisoners' statements, a Grenadier regiment suffered such casualties that it had to be relieved next day. It was also affirmed that a battery of artillery was destroyed by aircraft bombs and that the majority of the gunners, together with twelve horses, had been killed.¹ On the Third Army front an attack by the German 111th Division near Mory was held up. 'Under the heavy 'artillery and machine-gun fire and frequent attacks by air 'squadrons the attack cannot go on', says the history of the German 76th Regiment.

Air reconnaissances in the afternoon and evening of the 22nd of March reported widespread activity behind the whole German front. To hamper the enemy movements bombing raids were made by the head-quarters squadrons on the same railway junctions as were attacked on the 21st. Eight D.H.4's of No. 25 Squadron bombed Wassigny in the afternoon, while ten of No. 27 Squadron attacked Le Cateau and Busigny. On the Third Army front No. 49 (D.H.4) Squadron bombed a dump at Tilloy, north of Cambrai, and on the Fifth Army front No. 5 (Naval) Squadron, in two attacks, dropped one hundred and seventy-six 25-lb. and six 112-lb. bombs on the St. Quentin Canal bridges, and on villages and railway sidings in the vicinity. To the north, outside the battle area, distant bombing on railway junctions was done by squadrons of the I and II Brigades.

There was a great amount of desultory air fighting

¹ Twelve S.E.5a's of No. 84 Squadron dropped forty-five 25-lb. bombs on troops and transport near Holnon about 5 p.m. and claimed many direct hits.

in the afternoon and evening of the 22nd when large numbers of enemy aircraft were flying at all heights. Of the German low-flying aeroplanes which made attacks on the British infantry toll was taken: two were shot down by anti-aircraft fire,¹ and one by rifle or machine-gun fire from the ground.

The orders for the squadrons of the head-quarters Ninth Wing, on the 22nd, were for twelve 'Camels' of No. 73 Squadron to patrol the Third Army front for two hours between Marquion and Le Catelet, while twelve of No. 80 Squadron covered the Fifth Army front between Magny-la-Fosse and Brissy. The patrols were due to begin at 7 a.m. and to be repeated at intervals during the day. In addition, twelve Bristol Fighters of No. 62 Squadron were to patrol for two hours from 9 a.m. between Marquion and Le Catelet, and from 1 p.m. between Le Catelet and Itancourt, while six 'Dolphins' of No. 79 Squadron were to be on the line Vaux-Quessy for 1½ hours from 9 a.m., 11 a.m., and 3.15 p.m. The records of the squadrons, except No. 73, are missing, and it is impossible to say how far the above orders were fulfilled in the afternoon when flying became possible. No. 73 did one patrol, eleven strong, in the early afternoon, and had many combats. On the outward journey, near Ham, the leaders of the two 'Camel' formations, Captains A. H. Orlebar and T. S. Sharpe, led their pilots in a dive on a large German formation, and each leader shot down one Albatros, both of which were seen to crash—one in flames. Half an hour later, the 'Camels', north-west of St. Quentin, attacked a formation of eight Albatros fighters which were shortly joined by twenty others. In a brief, intense fight, one Albatros was destroyed and others driven down. The 'Camels', without loss, re-formed and went on to Roisel, where five two-seaters were found and attacked and two of them destroyed. Captain Orlebar received a bullet in the leg, but this was

¹ Figures are available of the action of the anti-aircraft defences on the Fifth Army front. These show that from the 21st of March to the 31st, inclusive, four Fifth Army anti-aircraft batteries destroyed seventeen aeroplanes, and hit and probably damaged twelve others.

22-23 the only casualty among the 'Camel' pilots, who returned
March to their aerodrome with a record of six German aircraft destroyed.

The fighter squadrons of the I, III and V Brigades had little respite throughout the day. Owing to the fact that they made many attacks, with bombs, on ground targets, much of the fighting took place at low heights. A total of thirty-one German aeroplanes were claimed as destroyed in combat along the whole British front (chiefly, however, on the fronts of the Third and Fifth Armies), while the Royal Flying Corps casualties were four aeroplanes missing, fifteen wrecked, and eleven (temporarily unserviceable after combat) burnt or abandoned when the squadrons moved back.

During the night of the 22nd/23rd of March No. 101 Squadron made many bombing expeditions to billets, &c., opposite the Fifth Army front between St. Gobain Wood and Bellicourt. The pilots had roving commissions and were to judge their targets by lights displayed by the enemy. In all, four hundred and eighty-four 25-lb. and six 40-lb. (phosphorous) bombs were dropped, and dumps near Travecy and Castres were set on fire. For part of the night, operations had to be stopped owing to bombing attacks on the aerodrome by German aircraft. Although the visibility was not good and prevented a special night reconnaissance which had been ordered to be made with the help of parachute flares, the bombing pilots and observers brought back a fair amount of useful information, notably that there was a great westward movement of troops and transport on the Mont d'Origny-St. Quentin road. No. 102 Squadron attacked billeting areas and trains, throughout the night, opposite the Third Army front and dropped three hundred and twenty-one 25-lb. bombs. Other night-bombing, north of the battle area, was done, notably by Nos. 58, 83, 2, 16, and 4 Squadrons.

The information supplied by the night bombers of No. 101 Squadron, that great numbers of enemy troops were moving along the Mont d'Origny-St. Quentin road, reached the Fifth Army Commander at 3 a.m. on the

23rd. This news of fresh masses moving towards the thin *23 March* line of the Fifth Army, when considered with the fact that the enemy had already forced the line of the Crozat Canal and had also taken the Vaux-Poeuilly positions, led the Fifth Army Commander to alter his decision, conveyed to the various Corps a few hours before, to offer battle east of the Somme. The XIX Corps were now ordered by telephone to withdraw gradually west of the Somme with outposts east of the river. These orders were confirmed on the 23rd at 9.30 a.m. and the VII Corps were told to conform and take up the general line Nurlu-Doingt. These orders meant an abandonment of the main Péronne bridgehead position, but a battle east of the river fought by fresh and overwhelming numbers of the enemy against the tired troops of the Fifth Army might have led to a decisive defeat with a consequent open road to Amiens ready for immediate exploitation.

The pressure was great along the whole battle-front throughout the 23rd of March. North of the Bapaume-Cambrai road, the centre of the Third Army, fighting relentlessly, yielded little ground. The air reports, helped by the good visibility after a morning haze, revealed the strength of the attacks on this front and the stubborn resistance of the IV and VI Corps of the Third Army. German troops were reported from the air moving to the attack most of the day, and the sway of the battle, particularly at Mory, where a break-through was threatened, and at Beugny, can be followed in the contact-patrol reports supplied to the defending commanders by the Corps squadrons. So serious was the threat on this part of the Third Army front that the squadrons of the Royal Flying Corps were called upon to extend their low-flying attacks. The orders were for two Flights of No. 3 Squadron to leave at dawn on the 23rd for attacks on ground targets and for two Flights of No. 46 ('Camel') Squadron to stand by for similar work as required. Other squadrons, however, were also used as the magnitude of the German effort became apparent.

Some of the records of the fighting squadrons are missing, but their main activities are clear enough. Four

23 March 'Camels' of No. 46 Squadron which left at 2.25 p.m. attacked massed troops on the outskirts of Vaulx-Vraucourt. At 3.20 p.m. eight S.E.5a's of No. 41 Squadron were sent out specially to attack troops in trenches and on roads in the Bapaume-Cambrai area, which they did with effect. A little later R.E.8's of No. 59 Squadron, followed by S.E.5a's of No. 56, were over Vraucourt shooting at and bombing masses of German infantry and transport.¹ At the same time two Flights of 'Camels' of No. 4 (Australian Flying Corps) Squadron, one of the fighting squadrons of the First Army which were employed over the Third Army area, flew one above the other and found plentiful targets in Vaulx-Vraucourt and on the roads and fields east and west of the village. While the Australian pilots were attacking, German fighters intervened and two of them were shot down and crashed by the leader of the upper Flight of 'Camels'. Eight 'Camels' of No. 3 (Naval) Squadron (also First Army) went out on low offensive patrol at 4 p.m., and six at 4.30 p.m., and both formations had many combats in the neighbourhood of Vaulx-Vraucourt, as a result of which two enemy fighters were destroyed. 'Camels' of No. 46 Squadron were over the battle area again at 5.10 p.m. and, some time in the afternoon, fighters from the head-quarters Ninth Wing squadrons also took part in the low-flying operations on this front.

South of the Bapaume-Cambrai road the right Corps of the Third Army, which had held the Flesquières salient, was compelled to fall back to conform with the retirement of the Fifth Army. The failure to evacuate the salient in time gravely imperilled the safety of the garrisons, and led to the Third Army losing touch with the Fifth in spite of G.H.Q. orders that it was responsible for maintaining touch. The retirement of the Fifth Army to the Somme was made in the face of incessant attacks by superior numbers of comparatively fresh German infantry. The enemy began by increasing his hold in the morning west of the Crozat Canal, the passage

¹ About 3.30 p.m. five German infantry attacks were launched from the direction of Vaulx-Vraucourt and five from Beaumetz-lez-Cambrai.

of which he forced at Jussy and Mennessis. Thence *23 March* throughout the afternoon there was fierce and confused fighting in the wooded ground west of the canal. Farther north, at Ham, which the enemy entered in the morning, the passage of the river was forced, as it was also at Pithon. But north of Ham, where the XVIII and XIX Corps were in position west of the Somme by the afternoon, with the majority of the bridges in front of them destroyed, no Germans had crossed the river by night-fall of the 23rd.

At the junction of the Third and Fifth Armies the weakness developed. During the morning the VII Corps—the left Corps of the Fifth Army—was ordered to withdraw from the Nurlu line to the Canal du Nord. Its rear-guards were driven back, and the V Corps—the right Corps of the Third Army—unwilling to evacuate the salient did not retire sufficiently far and thereafter touch between the adjacent Corps was spasmodic. In heavy fighting in the afternoon, the VII Corps was pushed back west of Péronne to the high ground about Bouchavesnes and south of Sailly-Saillisel with the V Corps on its left along the Green Line which extended northwards east of Ytres. There was, however, a gap of three miles between the two Corps.

The oncoming sweep of the German masses and the withdrawal of the British Corps throughout the 23rd was reported in some detail by the contact-patrol observers who had remarkable views of the struggle. There was little shell-fire on either side, but one great stretch of the battle area was obscured in the afternoon by smoke which spread back as far as Nurlu from burning stores in Péronne. Many wireless calls from the air for fire on German advancing troops went unanswered owing to the rapidity with which the British batteries had to move and to the fact that they could not, or did not, erect their wireless aerials. There were, however, exceptions, notably on the XIX Corps front, where wireless calls, or dropped messages, brought fire to bear on strong columns of German infantry. All the Corps aeroplanes carried bombs and the pilots and observers, who seldom flew above 1,000 feet, took full

23 March advantage of the unique targets offered to them. Enemy airmen were numerous over the front and the Corps aeroplanes were involved in many combats, but were seldom prevented from fulfilling their tasks. A typical example of the part played in the battle by the pilots and observers of the Corps squadrons may be quoted. Lieutenants W. E. Joseph and G. W. Owen of No. 35 Squadron made two contact-patrol flights in front of the XIX Corps in the afternoon. Their first began at 2 p.m. and ended at 3.35 p.m. Here is their report:

- ‘2.25. Bridge at 0 15a 7.9. [map reference of a bridge over the Somme north of Éterpigny] seen to be destroyed.
- 2.35. Large numbers of enemy infantry advancing in 0 11 a and b [north of Le Mesnil]. 300 rounds fired into these.
- 2.40. Many infantry seen advancing west of Mons-en-Chaussée. Dropped four 25-lb. bombs on them causing many casualties and scattering them. Fired 150 rounds into them.
- 3.5. Mass of enemy, about 2,000, advancing west of Mons in 0.27d [towards Brie on the Somme]. Sent ‘LL’ call which was answered by field batteries [the ‘LL’ signal called upon all available batteries to open fire on a very favourable target].
- 3.15. Attacked by 7 enemy aircraft (Scouts) at 300 feet and followed as far as Foucaucourt. Total of 700 rounds fired into enemy infantry.
- Visibility:—Poor. Height 800 feet.’

The two officers went away again at 4.10 p.m. for an hour and ten minutes and reported:

- ‘4.15. Bridge at Brie seen to have been destroyed. 5 tanks seen east of Brie bridge.
- 4.30. Attacked by 2 enemy aircraft which retreated but returned directly with 5 more.
- 4.45. Dropped message sending S.O.S. to field batteries on large mass of enemy infantry (about 3,000 yards) advancing in V2 central [north-east of Athies]. Also sent call by wireless which was answered. 4 25-lb.

bombs dropped on enemy at V2 central causing 23 March casualties. 350 rounds fired at enemy infantry.

Visibility:—Fair. Height 500 feet.'

Special low-flying attacks on the Fifth Army front on the 23rd were made by No. 24 (S.E.5) Squadron, while No. 84 (S.E.5a) and other squadrons combined low-flying attacks with offensive-patrol duties. No. 24 Squadron sent up four aeroplanes at intervals of two hours throughout the day from 8.50 a.m. and their pilots found ample targets, especially along the St. Quentin—Amiens road. Soon after midday, a formation of twelve S.E.5a's of No. 84 Squadron, flying north-west of Ham, saw two columns of marching troops east of Voyennes and dived and attacked. 'Large swarms of enemy troops were then observed 'advancing across fields near Viefville', mostly in bodies about 300 strong, and, for twenty minutes, until their ammunition gave out, the S.E.5a pilots flew as they liked in a series of relentless attacks on the German troops. Elsewhere, by other pilots, 500 mules were bombed and stampeded, and cavalry were attacked and scattered (by eight Spad pilots of No. 23 Squadron). In the evening, at 6.15 p.m., eleven S.E.5a's of No. 84 Squadron, out on offensive patrol with forty bombs slung under their fuselages, found and attacked many targets of troops and transport.

The day bombing squadron—No. 49—of the III Brigade made two raids, one in the morning against Oisy le Verger, north-west of Cambrai, with eleven D.H.4's, when many hits were made on the village and dump, and one in the afternoon when five D.H.4's bombed the de-training centre at Quéant.

No. 5 (Naval) Squadron made four bombing flights on the Fifth Army front, mainly in an attempt to stem the rush of reinforcements towards the Péronne area. Villers-Faucon, Roisel, Templeux-le-Guérard, Vendelles, Bernes, Marquaix, Vermand, Tincourt-Boucly, and Tertry, and troops and transport on the roads in their neighbourhood, were the targets of this squadron, which dropped a total of twenty 112-lb. and four hundred and sixty-four 25-lb. bombs. North of the main battle area, Haubourdin, near

23 March Lille, was twice attacked by D.H.4's of No. 18 Squadron (I Brigade) and Lille station twice by D.H.4's of No. 57 Squadron (II Brigade).

The objectives of the day bombers of the head-quarters Ninth Wing squadrons on the 23rd were once again the railway junctions at Wassigny, Busigny, and Le Cateau. In the morning six D.H.4's of No. 27 Squadron attacked Le Cateau and five Busigny. Wassigny was attacked twice by No. 25 Squadron, in the morning by nine D.H.4's and in the afternoon by five D.H.4's. In the afternoon, also, a German camp south-east of Cambrai was attacked by No. 27 Squadron. All the day bombing by the D.H.4's was made from heights between 14,000 and 16,000 feet.

There was more air fighting on the 23rd than on the first two days of the battle, and all combats took place at heights under 10,000 feet. Fighting was most severe on the front of the Third Army involving the fighter squadrons of the Thirteenth Wing, and six squadrons from the I Brigade (Nos. 2 and 4 Australian, No. 3 Naval and Nos. 22, 40, and 43).¹ In addition, offensive formations of the Ninth Wing took part in the fighting on the Third Army front. Offensive patrols as ordered for the squadrons of this head-quarters wing were to cover at intervals the lines between Havrincourt Wood and Brissy, south-east of St. Quentin, with other patrols between St. Simon and Roisel and between St. Quentin and Gonnellieu. Records are not available to show how far the patrols took place as ordered, but there are accounts of successful combats to show they were made at least in part. An analysis of the combat reports shows that a total of thirty-nine German aeroplanes were claimed as destroyed along the whole British front. Of this number three only were shot down outside the battle area (on the Second Army front), while twenty-eight were accounted for on the Third Army front.²

¹ On the 23rd the III Brigade with the Third Army was reinforced by No. 60 (S.E.5a) squadron from the II Brigade and by Nos. 43 ('Camel') and 22 (Bristol Fighter) squadrons from the I Brigade. These squadrons did not operate under III Brigade orders until the 24th.

² General Ludendorff's son was one of the Royal Flying Corps victims. In his book, *My War Memories*, p. 602, General Ludendorff says: 'the

The Royal Flying Corps casualties were, in comparison, ²³⁻²⁴ not heavy. Five aeroplanes were missing, twenty-eight *March* wrecked from all causes, and five (temporarily unserviceable) burnt or abandoned. These losses occurred on the Third and Fifth Army fronts except six aeroplanes wrecked in the northern area.

During the night of the 23rd/24th of March No. 101 Squadron could do no bombing because it had to shift quarters from its aerodrome at Catigny to Fienvillers, but the F.E.2b's of No. 102 Squadron tried to make up for the absence of No. 101 Squadron. The targets were German billeting villages in the northern area of the battle-front opposite the Third Army and, between 8 p.m. on the 23rd and 5 a.m. on the 24th, six hundred and sixty-three 25-lb. bombs were dropped on these villages, and 14,000 rounds of ammunition fired by No. 102 Squadron. Other night bombing was done north of the battle area by various squadrons, notably by twelve F.E.2b's of No. 58 (head-quarters) Squadron which bombed dumps at Bissegheem and Isegheem, starting a fire in the latter place which burned throughout the night.

On Sunday the 24th of March the situation between Péronne and the Bapaume-Cambrai road, that is, the area covering the junction between the Third and Fifth Armies, became extremely critical. At 2.30 a.m. on the 24th the V Corps, the right of the Third Army, reported that the enemy had penetrated to Bus, though only in small numbers, but it was not until about 8 a.m. that the seriousness of the German thrust into the southern part of the Third Army area was revealed to an air observer of No. 15 Squadron. He was over the front at 7.45 a.m. and saw that the enemy was in strength in Sailly-Saillisel and was advancing north and west of the village. British troops were seen to be trying to extend their right flank from Rocquigny towards Sailly-Saillisel. This news

'battle cost me a great deal also. My wife's youngest son fell on the 23rd. He was a flying officer and was at first reported missing. On the battle-field we found a grave with the English inscription: "Here rest two German flying officers." I had the sad task of identifying my son. Now he rests in German soil.'

24 March was grave. The enemy seemed to be thrusting a wedge between the two armies at a place left vacant by the Third Army, and was threatening to widen the breach by pushing the Third Army towards the north-west.¹ Thereafter the air reports revealed the development of the threat. At 10 a.m. an observer of No. 8 Squadron said that Clery, on the north bank of the Somme, had fallen, and, about an hour later, another aeroplane was heavily engaged by German anti-aircraft fire when trying to make a reconnaissance of Combles. In the early afternoon it was known that Combles had fallen and that German troops were pushing north to Lesboeufs, which fell at 3.45 p.m. Orders now went out to the V and IV Corps Commanders of the Third Army to retire and establish the approximate line Bazentin-Martinpuich-le Sars-Gréville-Sapignies. The retirement went on under extreme difficulties, and that the enemy would lose no time in following up his advantage was clear from air reports in the late afternoon. At 5.10 p.m. he was reported from the air on the line Le Transloy-Lesboeufs-Ginchy-Combles-Maurepas-Clery-sur-Somme, but there was a westward movement to Guillemont from Combles of 3,000 cavalry. Other reports told of an advance in force from Combles towards Maricourt and from Lesboeufs towards Longueval. The Third Army staff, when sending out the air information by wire at 6.43 p.m., stated that the Fifth Army had ordered cavalry to hold Maricourt and try to block these two roads, that the Tank Corps at Bray-sur-Somme were sending out all the men they could scrape together, with machine-guns, to hold the line Fricourt-Contalmaison, and instructed the V Corps to appoint an officer as Officer Commanding Albert, charged with the duty of organizing all available

¹ A special order of the day, to all ranks of the British Army in France and Flanders, was issued by Sir Douglas Haig: 'We are again at a crisis in the war. The enemy has collected on this front every available division and is aiming at the destruction of the British Army. We have already inflicted on the enemy in the course of the last two days very heavy loss and the French are sending troops as quickly as possible to our support. I feel that every one in the army fully realizing how much depends on the exertion and steadfastness of each one of us will do his utmost to prevent the enemy from attaining his object.'

forces to delay the German advance.¹ Meanwhile, also, *24 March* the 36th Division was being hurried forward and these various troops came into action and checked the enemy advance, so that a line was taken up and held from Hem to Trones Wood and Longueval, and onwards through Bazentin-High Wood-Eaucourt l'Abbaye and west of Bapaume.

Continuous low-flying attacks with bomb and machine-gun were made throughout the day on the advancing German troops in this area. The German 261st Reserve Regiment passed through Morval at 12.30 p.m. towards Ginchy. 'During the hot hours of the afternoon', says the regimental history, 'there was a pause, especially as the 'very active fighting and bombing squadrons of the enemy 'in the clear air imposed a very cautious advance on us.' Farther north, the 52nd Reserve Regiment came under air attack. '4 p.m. Advance resumed to cross the Bapaume-Péronne road. Hostile airmen, flying low, delay the march 'with machine-gun fire and bombs, especially on the 'Transloy-Lesboeuufs road.'

South of Péronne, the Somme line as far as Epénancourt was maintained on the 24th, but at Pargny the enemy extended his hold west of the river and reached Morchain, while, farther south, strong attacks carried the German front to the Libermont Canal. All along this front, where fighting was bitter, enemy aircraft were very active all day, but the Corps squadron observers reported the German movements and, with the fighting pilots, continuously bombed the enemy troops. At Béthencourt, where British counter-attacks prevented the enemy, for some time, from exploiting his crossing of the river, an observer of No. 35 Squadron called up the 114th Siege battery and proceeded, until he was wounded by fire from the ground, to direct the guns on the Béthencourt bridge. The battery kept up its fire from 2.30 p.m. to 5.45 p.m. and did much to impede the enemy advance in this sector. While this firing

¹ On the 23rd orders had been issued by the Third Army for the construction of a new line of defence northwards from the Somme at Suzanne. All available labour was concentrated on this work, including all balloon companies (except No. 28 Section) with the Third Army.

24 March was in progress another observer of the same squadron reported German troops massing for attacks at Béthencourt and Pargny, and low-flying aeroplanes were at once sent out to attack them. There is some evidence from the German side of the effect of the air attacks. The 12th Grenadier Regiment crossed at Pargny and Béthencourt about 5 p.m. 'During the advance', says the regimental history, 'one Company lost twelve killed and eight 'wounded by air bombs.' A Bugler in the 8th Grenadier Regiment gives a colourful account of the fortunes of his company in the advance. 'As we were moving forward 'again', he says, 'towards the firing line after crossing the 'Somme, there suddenly appeared before us some twenty 'British aeroplanes which dived to a height of about 100 to '200 metres, and then, continuing to within 2-3 metres of 'the ground, attacked us with their machine-guns. At 'first we thought they intended to land; but we speedily 'saw the danger, and opened a vigorous fire upon them. 'Several "Tommies" flew so low that the wheels of their 'aeroplanes touched the ground. My company commander, Lieutenant Nocke, had to fling himself flat on 'the ground, but for all that he was struck on the back by 'the wheels of one machine, thus being literally run over. 'Not far from me an aeroplane appeared at about one 'metre above the ground, making straight for me and for 'the moment I did not know in what direction to throw 'myself: the pilot appeared determined to run over me. 'At the last moment I was able to spring clear as the 'machine whizzed past me and through the firing-line. It 'then turned, climbed a little, and sought to repeat the 'manœuvre, whereupon it was hit by one of the companies 'firing on our left and brought down. In all, five enemy 'machines were shot in our Battalion's area.'¹

The main bombing by the head-quarters squadrons was once again directed against railway junctions. Aulnoye was attacked by six D.H.4's of No. 25 Squadron, and Landrecies by ten D.H.4's of No. 27 Squadron. The formation of No. 27 Squadron was attacked on the

¹ Low-flying aeroplanes were shot down in this area as follows: No. 35 Squadron, 3; No. 48, 1; No. 54, 1; No. 62, 1; and No. 73, 1.

homeward journey by eleven enemy aeroplanes and two *24 March* of the D.H.4's were damaged and a pilot and observer wounded. No. 49 Squadron, in the Third Army area, made two raids, on the railway at Aubencheul (eight D.H.4's), and on the station at Quéant (eleven D.H.4's).¹ No. 5 (Naval) Squadron, on the Fifth Army front, attacked the St. Quentin Canal bridges between Bantouzelle and Bellicourt and the railway station at Roisel.²

Air fighting on the 24th showed a marked increase, much of it taking place at heights under 5,000 feet. A total of forty-two German aeroplanes were claimed as destroyed, of which twenty-four were shot down on the front of the Third Army and seventeen on the front of the Fifth Army. The Royal Flying Corps losses for the whole front for the 24th were eleven aeroplanes missing, forty-six wrecked, and eight burnt or abandoned. Of this total thirteen were wrecked and one abandoned on the front north of the battle area.

A pilot of No. 43 ('Camel') Squadron, which had newly reinforced the Third Army squadrons, created a record by shooting down six German aeroplanes in one day. He was Captain J. L. Trollope and the reports of his combats read as follows:

'11 a.m. Whilst leading my patrol east of Mercatel, I 'saw three D.F.W.'s some way away trying to cross the 'line. I worked round east and attacked one, but was 'forced by gun-jams to break off. I corrected my guns 'and then attacked another D.F.W. I fired about 100 'rounds at point-blank range. Enemy aircraft went down 'in a spin and broke up about 1,000 feet below me. This 'was seen by Lieutenant Owen.

'I then attacked another D.F.W. with Lieutenant Owen 'and after firing 75 rounds, the machine burst into flames 'and fluttered down on fire. This was confirmed by 'Lieutenant Owen who also engaged it. I then saw an 'Albatros Scout coming down on to one of our formations.

¹ The total of bombs dropped on the 24th by all squadrons of the III Brigade was: eight 112-lb. and one thousand and twenty-two 25-lb.

² The total for the V Brigade was: four 112-lb. and five hundred and twenty-eight 25-lb. bombs.

²⁴⁻²⁵
March 'I dived on him and fired about 100 rounds. Enemy aircraft fell completely out of control. This was seen to crash by Captain Woollett.

'3.20 p.m. When I was leading my patrol over Sailly-Saillisel at about 6,000 feet, I saw four enemy aircraft 'two-seaters trying to interfere with R.E.8's. I dived 'down with my formation and attacked one enemy aircraft. 'I fired a short burst at close range and the enemy machine 'fell to bits in the air. I saw two of my patrol engaging the 'other three two-seaters at close range and I saw two 'enemy aircraft go down completely out of control and 'crash. I gathered all my patrol and flew about looking for 'the other enemy aircraft.

'I saw two pink two-seaters below me very close to the 'ground: I attacked each in turn from about 20 feet and 'they both nose-dived into the ground and I saw both 'crash. I climbed up and saw the rest of my patrol engaged 'by a large formation of enemy aircraft scouts. I got into 'the scrap and was forced to return through lack of 'ammunition.'

Bombing was continued along the whole front during the night of the 24th/25th of March. No. 101 Squadron dropped two hundred and eighty-eight 25-lb. bombs on Somme bridges and on roads to the east, and claimed four hits on the bridge at Béthencourt. No. 102 Squadron attacked billets and transport on the congested Bapaume-Cambrai road with twenty-four 112-lb. and three hundred and eighty-eight 25-lb. bombs. During the night the enemy bombers scored a success: between 8.40 p.m. and 1 a.m. an unknown number of heavy bombs fell on Amiens and on Longueau, the railway triangle to the south-east. The main damage was at Longueau, where an ammunition train of forty-one trucks blew up with consequent damage to the railway track which interrupted traffic until 11 a.m. on the 25th.¹

At 11.20 p.m. on the 24th General Head-quarters issued

¹ In a memorandum dated the 2nd of June 1918 General Plumer quoted this attack on Longueau as an example of the dislocation which can be caused by bombing an important railway centre. 'The attack', he said, 'was not continued long enough to produce anything like decisive results.'

orders that the VII Corps together with all troops of the Fifth Army operating north of the Somme (including No. 8 Squadron, Royal Flying Corps) was to come, henceforth, under the orders of the Third Army Commander. The Cavalry Corps was to assemble under the Third Army for the protection of the right flank. The orders also stated that the French Commander-in-Chief had agreed to take over the front south of Péronne, and the Fifth Army, therefore, was to come under the direction of General Fayolle, commanding the Group of Armies of Reserve. These readjustments of command took effect on the 25th of March.¹

The news that came in during the 25th was increasingly grave. A great bulge towards Roye was made into the line of the French Third Army (General Humbert) which had taken over the right of the British Fifth Army, and the separation of the British and French armies was threatened. Even more serious was the rapid exploitation of gaps on the Third Army front which took the enemy troops forward to the Ancre. The massing of the enemy for the determined attacks on the V and IV Corps of the Third Army had been reported by No. 59 Squadron. The first aeroplane of this squadron left the ground at 5.55 a.m. and, at 7.30 a.m., the observer reported great concentrations of German infantry on both sides of the Cambrai road just east of Bapaume. He sent a wireless call for fire by all guns that could be brought to bear, and also dropped a message giving the information to the nearest British infantry with a request that they should pass on the news to batteries in the neighbourhood. Messages were also dropped on the corps and divisions. No fire was brought to bear in answer to these messages while the observer was still over the area. By the afternoon the line was crumbling between Montauban and Ervillers. Everywhere great

¹ 'The Fifth Army was thus cut off from General Head-quarters as regards military operations, and General Head-quarters gave up all responsibilities for the British troops under my command south of the Somme. . . . Placing the Fifth Army under Fayolle's group of armies made no material difference. He issued no orders to me, and I only saw him once for a few minutes.' (*The Fifth Army*, General Sir Hubert Gough, pp. 291-2.)

25 March masses of enemy in this area were reported by the Corps squadron observers. At 2 p.m. columns were advancing on Achiet-le-Grand. At the same hour the Royal Flying Corps informed the Third Army that there were about 10,000 German troops attacking the IV Corps between Bapaume and Ervillers. Eight wireless calls from air observers on the Third Army front were answered throughout the day, and, as a result, direct hits were made on columns of German infantry north of the Bapaume-Cambrai road.

It was on this day, and against the great German effort to break in at the junction of the VII and V Corps of the Third Army, that the maximum possible weight of the Royal Flying Corps squadrons was diverted to low-flying attacks. As soon as the danger was revealed Major-General J. M. Salmond, after consultation with the Chief of the General Staff, sent a message (timed 11.5 a.m.), by hand, to the Officer Commanding the Ninth Wing as follows: 'I wish you as soon as you can after receipt of this 'to send out your scout squadrons and those of No. 27, 'No. 25, and No. 62 Squadrons that are available on to the 'line Grévillers (just west of Bapaume)-Martinpuich-Maricourt. These squadrons will bomb and shoot up 'everything they can see on the enemy side of this line. 'Very low flying is essential. All risks to be taken. Urgent.'

Furthermore, ten squadrons (including five Corps squadrons)¹ from the I Brigade operating from the First Army area, and two squadrons from the V Brigade, made a concentrated effort to help. All this was additional to the operations of the squadrons of the III Brigade working with the Third Army. 'Camels', S.E.5's, Bristol Fighters, R.E.8's, D.H.4's, and Sopwith 'Dolphins' were flown over the enemy at low heights, and pilots fired all their ammunition at, and dropped all their bombs on, the plentiful targets offered to them, and then returned to their landing-

¹ The Corps squadrons were Nos. 2, 4, 5, 16, and 42. Three pilots and two observers were wounded, and one pilot and observer missing, all due to fire from the ground. The use of Corps squadron aeroplanes for this work, for which they were unsuited, is eloquent of the grave emergency which existed.

grounds to reload.¹ It is impossible to give specific details *25 March* of the effects of the aircraft attacks, but the targets were so exceptional and the pilots fulfilled their orders with such determination that their great influence on the day's battle cannot be disputed. The battalions of the German 2nd Guards Reserve Regiment reached camp south-east of Bapaume in the early morning. 'The stay', says the regimental history, 'in the hut camps east of Bapaume was 'not very pleasant because airmen bombed us causing 'heavy losses.' The 248th Reserve Regiment rested east of the Martinpuich-Bazentin-le-Petit road. 'The strong 'activity of the airmen was most unpleasant', they record: 'A squadron of about fifteen machines harassed us with 'bombs and machine-gun fire against which our machine-gun fire was powerless.' Says the 52nd Reserve Regiment: '6 a.m. Advance westwards continued. After only twenty 'minutes' marching the first hostile airmen flying low 'appear and seek to delay the advance with machine-gun fire. 'There were about 25 airmen over the regiment. There 'is only a little cover.' The same regiment approached Thiepval in the afternoon and records: 'The English advance from Thiepval to counter-attack. They are repulsed. This afternoon the hostile airmen are present in 'crowds. We count more than thirty above us at the same 'time.'

Owing to the diversion of the activities of the day-bombing squadrons on the 25th to attacks on ground targets, little distant bombing was undertaken. No. 49 Squadron, from the III Brigade, attacked the stations at Cambrai and Quéant. On the Fifth Army front No. 5 (Naval) Squadron made a morning raid on hutments and

¹ Writing to Major-General Sir Hugh Trenchard on the night of the 25th, Major-General J. M. Salmond said: 'I am out of touch with the 3rd Brigade and 9th Wing. I hope this connexion will be rectified in an hour 'or two. I am out of touch with the 5th Brigade. This should be connected 'again by to-morrow morning. I can tell you this, however, that we 'managed to concentrate 100 machines on the threatened line in the 3rd 'Army. They had orders to fly low and to take every risk; nothing was to 'count in carrying out their duties. I had news from the I Brigade that our 'machines were so thick over this point that there was every danger of 'collision in the air . . .'

25-26 troops in the villages of Tertry, Monchy, Athies,¹ and
March Mons-en-Chaussée, but in the afternoon the squadron's bombing was diverted to the critical sector on the Third Army front and troops were attacked on the Péronne-Bapaume road.

It was clear on the evening of the 25th of March that the enemy was concentrating his effort against the VII and V Corps on the new Third Army front, and a further massing of troops in the neighbourhood of Bapaume was reported. It was known also that traffic movements were centring on Péronne. The two night-bombing squadrons, therefore, were ordered to concentrate all their efforts during the 25th/26th on these towns and were told to make as many trips as possible. The night was stormy, with hail and snow, but pilots of No. 101 Squadron dropped one hundred and sixty-eight 25-lb. bombs on Péronne, while No. 102 Squadron attacked Bapaume with four 112-lb. and two hundred and fifteen 25-lb. bombs. No. 83 Squadron, of the IX Brigade, attacked the dumps at Marquion on the Arras-Cambrai road, with three 230-lb. and twenty-seven 25-lb. bombs. Three pilots of No. 58 Squadron of the same brigade attacked the aerodrome at Avelin, south of Lille.²

On the 26th of March the Royal Flying Corps activities were again mainly concentrated on low bombing and machine-gun attacks to stem the advance against the VII and V Corps.³ The head-quarters day-bombing squadrons had orders, issued on the evening of the 25th, to attack Bapaume and Péronne from low heights and as frequently

¹ The regimental history of the 100th Grenadier Regiment says: 'Early in the day the I and II/100 were ordered to assemble near Athies and suffered losses of 8 officers and 125 men in a few seconds from air bombs.' The air report of the pilot who bombed Athies says: 'Three bombs burst among troops and transport in fields on the side of the road.'

² Two Flights of No. 58 Squadron had been transferred to the aerodrome of No. 102 Squadron at le Hameau for work on the Third Army front, and the third Flight to Auchel, the aerodrome of No. 83 Squadron.

³ At 2.20 a.m. on the 26th the Third Army Commander issued orders 'that every effort was to be made to check the enemy's advance, disputing the ground. No retirement was to take place unless the tactical situation imperatively demanded it.'

as possible with the object of dislocating traffic, and the *26 March* head-quarters fighter squadrons were ordered to make low-flying attacks against troops north of the Somme. But later in the evening of the 25th, when a further massing of German troops west of Bapaume was reported, all head-quarters squadrons were newly instructed as follows: 'A concentration of enemy troops has been located just west of Bapaume. Every available machine of the Ninth Wing will leave the ground so as to attack this concentration at dawn with bombs and small-arms ammunition and break it up before any attack develops.' At the same time the hard-pressed remnants of the Fifth Army were called upon to make a contribution to resist this threat north of the Somme. The General Officer Commanding the V Brigade received the following message from Major-General J. M. Salmond. 'A very large concentration is reported just west of Bapaume. The Chief of the General Staff is anxious that every available machine exclusive of those required immediately by the Army concerned should be concentrated on this area. I have been in touch with the 22nd Wing and have ordered them to send every available machine out at dawn to bomb and shoot up this area. Will you, therefore, concentrate every available Corps machine you can at dawn on the same area and keep it up throughout the day.'

All available squadrons of the III Brigade with the Third Army—except No. 13 (Corps) Squadron and six fighter squadrons—were given orders for low-flying attacks, and reinforcements were drawn upon from the two brigades to the north. Except the Corps squadrons,¹ all squadrons of the I Brigade from the First Army area took part in the low-flying operations on the 26th and four squadrons (Nos. 1, 19, 20, and 57) from the II Brigade with the Second Army reinforced the I Brigade and took part in the low-flying attacks on the Third Army front.

The squadrons from the Fifth Army which flew over the Third Army front in the morning were three, Nos. 5 (Naval), 54 and 84, and made up a total of twenty-seven

¹ Corps squadrons of the I Brigade did, in fact, drop seventy-three 20-lb. bombs on targets on the Third Army front after 4 p.m.

26 March squadrons specifically engaged on the 26th of March on the offensive against ground targets on the Third Army front.¹ In addition, the Third Army had six fighter squadrons (Nos. 22, 41, 43, 56, 60, and 64) which were engaged on offensive patrols over the army front on the 26th, plus the services of one night-bomber squadron (No. 102) and the partial services of two others (Nos. 58 and 83). Thus, out of a total of sixty squadrons with the armies on the Western front, the Third Army, on the 26th of March, called on the services of no fewer than thirty-seven (including No. 13 Squadron). This leaves out of account a certain amount of bombing on the Third Army front by the Corps squadrons of the First Army.

The three squadrons which flew up from the Fifth Army front in the morning did good work. Two attacks, each by five D.H.4's, were made by No. 5 (Naval) Squadron. In the second attack direct hits were made on an ammunition dump at Pozières and other direct hits on a convoy on the road between Pys and le Sars. A German officer of the Field Artillery records: 'At Pozières station 'on our left hostile airmen had bombed and set fire to 'several trains containing ammunition and supplies; continual heavy explosions could be heard which destroyed 'one wagon after another.' Troops and transport in the Pozières area had been attacked between 6 and 7 a.m. by No. 54 Squadron and, at the same time, eleven S.E.5 pilots from No. 84 Squadron were flying up and down the Bapaume-Albert road continuously attacking German troops. These three squadrons then went back to the Fifth Army area where there was more than enough work to occupy their full attention.

The two head-quarters day-bombing squadrons (Nos. 25 and 27) dropped a total of forty-six 112-lb. and one hundred and ninety-three 25-lb. bombs on Bapaume, Péronne, and Biefvillers-les-Bapaume; the Third Army day-bomber squadron (No. 49) dropped fourteen 112-lb. and fifteen 25-lb. bombs on Bapaume; the Second Army day-bomber

¹ III Brigade, Nos. 3, 46, 70, 11, 49, 8, 12, 15, and 59; I Brigade, Nos. 3 (Naval), 2 (A.F.C.), 4 (A.F.C.), 40, 18; II Brigade, Nos. 1, 19, 20, 57; V Brigade, Nos. 54, 84, 5 (Naval); IX Brigade, Nos. 62, 73, 79, 80, 25, and 27.

squadron (No. 57) attacked the same objective with twenty-eight 112-lb. bombs; and the First Army day-bomber squadron (No. 18) dropped twenty-nine 112-lb. and two hundred and twelve 25-lb. bombs on Bapaume and its neighbourhood. In addition, some nine hundred light-weight bombs were dropped by the various other squadrons attacking on this front, and nearly a quarter of a million rounds of machine-gun ammunition were fired from the air on German troops. 26 March

On this day the crisis on the Third Army front may be said to have ended. In the morning the enemy had poured through the gap on the V Corps front between Beaumont-Hamel and Puisieux-au-Mont, but the situation was restored by Australian and New Zealand troops and the line, north of Albert, acquired a degree of stability. South of Albert, owing to a misunderstanding, the VII Corps retreated in the afternoon from the Bray-sur-Somme-Albert line, and before the withdrawal could be stopped, the right of the Corps had reached the Somme at Sailly-le-Sec thus uncovering the left flank of the XIX Corps which was at Proyart five miles up the river.¹

The Fifth Army, now reduced to the XIX Corps and fragments of the XVIII and III, ordered to hold the approaches to Amiens at all costs, was in desperate straits throughout the 26th. On the previous day the Fifth Army Commander had begun to collect a force made up of stragglers, school personnel, engineers, &c., together with the 6th U.S. (Railway) Engineer Regiment and, on the 26th, under the command of Major-General P. G. Grant, the Chief Engineer of the Fifth Army, this force prepared the old line of the Amiens defences from Mezières to the Somme at Hamel. Later, Brigadier-General G. G. S. Carey, an officer of field artillery returning from leave, took charge of this force which he commanded in the subsequent fighting. These were the only British reserves (strength, 2,200) available to General Gough.

In the morning of the 26th the enemy began an advance towards Roye with the object of separating the

¹ The withdrawal of the VII Corps was watched and reported by observers of No. 8 Squadron.

26 March

British from the French and with the further object of capturing Montdidier and so cutting the lateral railway communications. The seriousness of the threat at Roye, where a gap was forced, was indicated in an air report received by the Fifth Army Commander at 10.30 a.m. This told of great German forces concentrating on Roye from north-east, east, and south-east, and revealed that the direction of the French retirement was south-west towards Montdidier while the British withdrawal was in a north-west direction towards Amiens. Meanwhile, there were heavy attacks also on the XIX Corps northwards from Hattencourt to the Somme. By the afternoon this Corps had retreated, fighting all the way, to the line Froissy-Proyart-Rosières-en-Santerre-Rouvroy-en-Santerre with a four-mile gap on its right, south of which the XVIII Corps was in retirement. The XIX Corps held its ground despite the fact that its left flank was also in the air with the VII Corps five miles in a straight line nearer Amiens north of the river. It was not until 9 p.m. on the 26th that the XIX Corps Commander became aware of the full extent of the retirement of the VII Corps on the other side of the river, and he thereupon asked for help to protect his left flank. In answer to his request he was given 300 men of Carey's force and fifty machine-gunners.

The Royal Flying Corps squadrons co-operating with the Fifth Army were three Corps squadrons (35, 52, and 82), five fighter squadrons (23, 24, 48, 84, and 54), one day-bomber squadron (5 Naval), and one night-bomber squadron (101). Contact patrols of the three Corps squadrons with the Fifth Army followed the complicated ground movements, and continuously harassed the oncoming Germans with bomb and machine-gun. In the morning, while No. 84 Squadron was away north of the river attacking troops on the Bapaume-Albert road, No. 24 (S.E.5) Squadron was similarly engaged against German infantry on the northern part of the Fifth Army front. Nos. 23 (Spad), 48 (Bristol Fighter), and 54 ('Camel') Squadrons also attacked ground targets along the whole of the Fifth Army front. When it became clear from the air reports that the enemy had forced a gap at

Roye, all squadrons were called upon to concentrate their efforts to stem the German advance in this area. One pilot made a landing at the old aerodrome at Champien, east of Roye, but got off again quickly when a group of German staff officers galloped across the aerodrome. Four German infantry battalions, reported from the air to be 'debussing' on the Nesle-Roye road at 2.25 p.m., were made a special target and suffered from an intensive bombing effort, particularly by D.H.4's of No. 5 (Naval) Squadron. No. 5 (Naval) Squadron also bombed the bridges over the Somme east of the Fifth Army front.

Enemy air activity on the 26th was comparatively slight. 'There are many British but no German flying men up', complains a history of the German 2nd Foot Guards Regiment. The III Royal Flying Corps Brigade Commander noted the enemy air activity as 'slight on the whole', while the V Brigade Commander described it as 'normal' on his front. On the Fifth Army front No. 24 Squadron alone had decisive combats, shooting down four enemy aeroplanes while on low-flying work. On the Third Army front offensive patrols, some of them at a low height to protect the low-flying aircraft, were made by formations of Nos. 22, 41, 43, 56, 60, and 64 Squadrons. The only fighting throughout the day by these patrols fell to a formation of nine Bristol Fighters of No. 22 Squadron which, in the morning, found five Pfalz scouts east of Albert and destroyed three of them. A contact-patrol aeroplane of No. 59 Squadron accounted for an Albatros fighter which attacked it, and six other German aeroplanes were destroyed in the Bapaume area by pilots engaged on low-flying attacks against ground targets. The Flying Corps casualties in aircraft for the day on the battle-front were thirteen aeroplanes missing, twenty-six wrecked, and eleven (unserviceable) burnt or abandoned. Outside the battle-front four aeroplanes were wrecked.

It was on the 26th of March that General Ferdinand Foch was appointed to co-ordinate the efforts of the Allied Armies on the Western front. On the 24th at 11 p.m. Sir Douglas Haig had met General Pétain and had explained his plan of operations. The Third Army was to fall back, if

24-26 March pressed, pivoting on its left, but all available troops of the First and Second Armies were to be assembled near Arras to counter-attack southwards if the Germans got near Amiens. Sir Douglas Haig had invited the French Commander-in-Chief to co-operate by concentrating a large force astride the Somme near Amiens. General Pétain had been cautious. While he agreed to give General Fayolle, south of the Somme, all available troops, he stated that he had instructed him, if necessary, to fall back southwards on Beauvais to cover Paris. This was extremely grave news. It could only mean separation between the French and British armies. Sir Douglas Haig went back at once to his advanced head-quarters and telegraphed to the Chief of the Imperial General Staff (General Sir Henry H. Wilson) and to the Secretary of State for War (Lord Milner) to come to France. Lord Milner had, in fact, left London at 12.50 p.m. on the 24th at the request of the Prime Minister, to find what the position was and to report to the Cabinet. On the afternoon of the 25th there was a conference at Pétain's head-quarters at Compiègne at which Sir Douglas Haig and Sir Henry Wilson could not be present. At noon next day, the 26th of March, a further conference followed at Doullens.¹ It was there agreed that every effort must be made to save Amiens and it was decided that General Foch should be appointed to co-ordinate the action of all the Allied Armies on the Western front.²

There was a great amount of night bombing on the 26th/27th of March. No. 83 Squadron, and the one Flight of No. 58 Squadron operating from the same aerodrome at Auchel (Lozinghem) under orders to concentrate every effort to impede the passage of troops and transport

¹ Monsieur Poincaré, *President*, in the chair. *Present*: M. Clemenceau, M. Loucheur, Lord Milner, and Generals Haig, Foch, Weygand, Pétain, and Wilson.

² The formula, dictated by M. Clemenceau and written by M. Loucheur read: 'Le général Foch est chargé par les gouvernements britannique et français de coordonner l'action des armées alliées sur le front ouest. Il s'entendra à cet effet avec les généraux en chef, qui sont invités à lui fournir tous les renseignements nécessaires.' On the 3rd of April General Foch was given 'la direction stratégique des opérations militaires'.

through Bapaume, dropped six 230-lb., ten 112-lb., and two hundred and ninety-nine 25-lb. bombs on the town. ²⁶⁻²⁷ *March* The remaining two Flights of No. 58 Squadron, from the aerodrome at le Hameau, attacked troops and transport on the Bapaume-Albert and Péronne-Albert roads, and also bombed Péronne, Albert, and Courcellette. Pilots of these two Flights made a total of twenty-five journeys during which they dropped twenty-two 112-lb. and two hundred 25-lb. bombs and fired many rounds from their machine-guns from a few hundred feet. No. 58's total for the night of fifty hours flying was a record for this squadron which endured to the end of the war. The objectives of No. 102 Squadron were the villages of Mametz, Maricourt, Fricourt, and Suzanne, and roads in their neighbourhood and, between 9.11 p.m. and 5 a.m. forty trips were made by the squadron's pilots who dropped thirty-nine 112-lb. and two hundred and forty-six 25-lb. bombs. One pilot found a convoy, a quarter of a mile long, near Courcellette and scored direct hits on the column with one 112-lb. and two 25-lb. bombs. Another pilot saw troops, estimated at two battalions, in a field and on the road near Mametz Wood. He went down low over them and he and his observer expended all their machine-gun ammunition against the German infantry.

No. 101 Squadron (V Brigade) was ordered by Royal Flying Corps head-quarters to attack Ham as heavily and continually as possible, paying particular attention to the roads through the town and the bridges over the Somme. But after the attacks on Ham had begun, the squadron received instructions to direct all its further efforts against Cambrai instead.¹ 'It is hoped', said the Royal Flying Corps head-quarters message, 'that a record number of bombs will be dropped. It is of the utmost importance 'to delay enemy reinforcements coming up at this crisis, 'and inflict casualties on him.' Bombing by the squadron was continuous for seven hours and five hundred and two

¹ Abnormal train movements southwards from Lille were reported from the air on the 25th. It was known that heavy reinforcements were arriving at Cambrai. Actually between the 25th and 27th nine new divisions reinforced the German Second Army on the Cambrai front.

26-27 March 25-lb. bombs were dropped on Ham and Cambrai, where great activity was seen. Two hits were obtained on a train in Cambrai station, another on a canal bridge in the town, five hits on a column of transport moving into the town, two on a train at Marquion, and another on a dump which blew up. In addition to the bombing, over 4,000 rounds of machine-gun ammunition were fired at moving lights in the towns of Cambrai and Ham. The operations of the squadron were hindered to some extent by the frequent passage over the aerodrome of enemy bombing aircraft on their way to the British railway lines of communication. One pilot of No. 101 Squadron met an enemy aeroplane, showing navigation lights, and attacked it at close range. One hundred rounds were fired by the observer from twenty-five yards and the enemy aeroplane went down steeply and appeared to crash.

North of the battle area, Corps squadrons of the I and II Brigades attacked billets and rail-heads. The I Brigade objectives were chiefly the railway stations at Don, Annoeullin, Provin, and Brébières. While aeroplanes of No. 16 Squadron were landing, about 10 p.m. on the 26th, after bombing attacks, enemy aeroplanes dropped twenty bombs on their aerodrome at Camblain-l'Abbé and damaged ten aircraft. The II Brigade squadrons attacked the Roulers-Menin railway and a dump at Beythem.

Two Naval Handley Page squadrons (Nos. 7 and 14) also took part in the bombing of German communications. A telegram from the Air Ministry to Major-General J. M. Salmond on the 26th had stated: 'Admiralty have agreed 'to squadrons allotted for the bombing of Bruges being 'used for the present for any other purpose you may consider necessary.' On receipt of this message the Senior Naval Air Service Officer at Dunkirk had been instructed as follows: 'As many Handley Pages as possible will bomb 'the main railway station at Valenciennes to-night. It is 'of the very greatest importance to interrupt the flow of 'reinforcements to the main battle-front through Valenciennes and every endeavour must be made therefore to 'carry out as heavy an attack as possible.' Five Handley Pages from each squadron made their attacks about mid-

night. Three pilots failed to find their objective and bombed instead trains and junctions at Lens, Lille, Ostricourt, Tournai, and trains on the St. Quentin-le Cateau railway. Tournai was seen to be particularly congested with railway traffic and twelve 112-lb. bombs dropped there appeared to do much damage. The seven pilots who reached Valenciennes found the railway junction packed with traffic, and several hits from their four 250 lb. and seventy-six 112-lb. bombs were claimed on the station and among trains in the sidings.

The critical front from now onwards was south of the Somme. 'The enemy north of the Somme', says General Ludendorff, 'formed a fresh front, which was sure to be difficult to overcome. In the direction of Amiens the enemy's resistance seemed weaker. The original idea of the battle had to be modified, and the main weight of the attack rigorously directed on that point.'¹

North of the Somme on the 27th there was little change in the situation. During the night of the 26th/27th the enemy had taken Albert, but his many attempts to debouch from the town on the 27th were beaten off with heavy loss. Farther north, as a result of strong attacks which began at midday the enemy took possession of Ablainzeville and Ayette, but all other attacks were repulsed.² The fighting on the Third Army front was followed and reported by the contact-patrol aeroplanes of the Corps squadrons which also made attacks on enemy infantry formations from low heights. A number of wireless calls for artillery fire were answered, notably east of Albert and near Hebuterne, where concentrated artillery fire was brought to bear on German troops moving to attack.

Once again, the main flying work on the Third Army front was directed against ground targets. The whole area

¹ *My War Memories*, p. 599.

² A Third Army telegram sent out at 11.13 a.m. on the 27th said: 'It is to be distinctly understood that *no* retirement from our present position is permissible. All officers and other ranks are to be made to understand this. Most stringent orders must be issued by all commanders to this effect and officers who fail to observe the spirit of this order are to be relieved of their commands.'

27 March east of Albert seems, from a reading of the air reports, to have been thick with troops, and, from dawn, low-flying attacks in this neighbourhood were continuous. The German regimental histories make many references to these air attacks and tell of 'considerable losses' and the difficulties they imposed on the advance. Many other attacks were made in the Bapaume area. The two headquarters day-bombing squadrons, Nos. 25 and 27, operated on the Third Army front. No. 25 attacked Bapaume and Cambrai, and No. 27 Squadron bombed troops and transport in the Albert-Bray area. No. 57 day-bombing Squadron, from the II Brigade, attacked Bapaume and other squadrons of the same brigade (Nos. 1, 19, and 20) dropped one hundred and eleven 25-lb. bombs on various targets on the Third Army front. The Corps squadrons and fighter squadrons of the I Brigade, on the left of the Third Army front, once again did much of their flying over the Third Army area in attacks on ground targets, but also operated over the northern flank of the Fifth Army front.

One or two examples may be given, from many hundreds of similar ones, to illustrate these low-flying attacks:

No. 4 (Australian Flying Corps) Squadron.¹

'Lieutenant F. J. Scott dropped bombs on troops and transport on Albert-Bray road, just outside Bray, from 1,200 feet at 12 noon. Direct hits were observed. Fired 400 rounds at troops and transport on road just west of Bray from 800 feet.

'Second Lieutenant A. E. Robertson dropped a bomb on a store dump just north of Thiepval from 1,000 feet at 11.45 a.m. Explosion observed in corner of dump.

'Lieutenant G. M. Elwyn dropped bombs on mechanical transport parked in Bray from 1,500 feet at 8.30 a.m. One bomb caused a fire. Fired 500 rounds on troops leading north from Bray.'

¹ Statistics available for this squadron on the 27th of March may be quoted as an example of the work done by the fighting squadrons. Sixteen available pilots did an aggregate of seventy hours' war flying. In the four days 25th-28th of March an average of fifteen available pilots flew a total of 201 hours 20 minutes.

No. 19 Squadron.

27 March

'Patrol proceeded to the neighbourhood of Albert and dropped a total of 34 bombs on enemy troops in massed formation along the roads leading into Albert, and in the neighbourhood of Mametz. The German infantry were seen to scatter and to run about looking for cover, while in one case a large fire was seen to break out east of Albert. A total of 2,450 rounds were also fired into enemy troops marching along the roads in the same neighbourhood and many casualties were seen.

'Captain J. Leacroft, leading the patrol, dropped four bombs on the Albert-Pozières road where very large numbers of German infantry were seen to be massed. . . . With the Bristol Fighters above, and in and out a circus of other machines, he repeatedly dived at the German troops, firing 700 rounds into them from under 1,000 feet, and noticed many casualties.'

No. 40 Squadron.

'Captain G. H. Lewis fired in all 500 rounds at various targets on the Arras-Cambrai road. He attacked a gun which was being dragged across country by eight horses, causing a stampede. One horse was seen to be killed. Only small bodies of troops seen. Enemy trenches by Courcelles-le-Comte seemed very full and two ambulances were seen going east from them. Saw an enemy aircraft two-seater on the ground near Wancourt and fired into it. Enemy anti-aircraft fire very active.

'Lieutenant Warden was diving down on enemy transport in a side road at Achiet-le-Grand (transport going south), when 8 enemy aircraft scouts approached from the south. He attacked enemy aircraft with two Dolphin machines, and sent one down in flames.

'Lieutenant W. L. Harrison fired about 200 rounds at troops and transport at Ervillers, scattering troops, and transport came to a standstill. 6 Triplanes and 6 Albatros Scouts seen. He attacked and brought down an Albatros Scout out of control.'

One of the Corps pilots from the I Brigade (Second Lieutenant Alan Arnett McLeod, a Canadian, in an

27 March Armstrong-Whitworth of No. 2 Squadron), while on his way to take part in the attacks on German infantry east of Albert, gained the Victoria Cross for the following exploit, in which, it would seem, Baron von Richthofen's formation (*Jagstaffel 11*) was involved.¹

'Whilst flying with his observer (Lieutenant A. W. Hammond, M.C.), attacking hostile formations by bombs and machine-gun fire, he was assailed at a height of 5,000 feet by eight enemy triplanes, which dived at him from all directions, firing from their front guns. By skilful manœuvring he enabled his observer to fire bursts at each machine in turn, shooting three of them down out of control. By this time Lieutenant McLeod had received five wounds, and whilst continuing the engagement a bullet penetrated his petrol tank and set the machine on fire. He then climbed out on to the left bottom plane, controlling his machine from the side of the fuselage, and by side-slipping steeply kept the flames to one side, thus enabling the observer to continue firing until the ground was reached. The observer had been wounded six times when the machine crashed in "No-Man's Land", and Second Lieutenant McLeod, notwithstanding his own wounds, dragged him away from the burning wreckage at great personal risk from heavy machine-gun fire from the enemy's lines. This very gallant pilot was again wounded by a bomb whilst engaged in this act of rescue, but he persevered until he had placed Lieutenant Hammond in comparative safety, before falling himself from exhaustion and loss of blood.'²

South of the Somme on the 27th of March the enemy began his attacks about 8.30 a.m. on the Fifth Army and on the French to their right. As the line along which the Fifth Army stood would preserve Amiens from serious bombardment, orders had been issued for every effort to

¹ Richthofen claimed three personal victories on the 27th, all in the Albert area, but this aeroplane of No. 2 Squadron would appear to have fallen to some other member of his squadron.

² Second Lieutenant McLeod died of his wounds at Winnipeg, Canada, on the 6th of November 1918. Lieutenant A. W. Hammond, after the amputation of a leg, recovered.

be made to hold the positions. But the uncovering of the left flank of the Fifth Army by the mistaken withdrawal of the right Corps of the Third Army from Bray-sur-Somme on the previous afternoon, had made the position of the Fifth Army troops near the river an impossible one. The enemy passed infantry across the Somme to the south bank and thus took the left of the Fifth Army in the rear. As a result, the troops at Proyart and to the north were compelled to fall back. Thence the enemy tried to advance southwards behind the British line. There were no reserves behind this front, other than what was left of Carey's force, and the general position was serious. Troops from the 1st Cavalry Division were thereupon hurried across the river, and determined counter-attacks by battalions of the 8th Division and of the 66th Division brought the enemy to a halt west of Framerville. Elsewhere, the Fifth Army divisions fought all day and gave little ground, but, on their right, the French were forced to give way and the Germans captured Montdidier. In view of what the Fifth Army had suffered from the day the German offensive opened, the conduct of the troops on the 27th, grey with utter weariness, was magnificent.

In their resistance they had considerable help from the Royal Flying Corps. Whereas on the previous day the main weight of the air offensive against ground targets had been centred on the Third Army front, chiefly in the Bapaume area, it shifted, on the 27th, to the Somme. Many flights were made by aeroplanes of the I, II, and III Brigades over the river, particularly in the area where the enemy crossed behind the left flank of the Fifth Army. The fighter squadrons of the head-quarters Ninth Wing were also diverted to the area Albert-Proyart and made continuous attacks throughout the day on German troops and transport. Much of the activity of the Corps squadrons with the Fifth Army was also taken up with bombing German troops. No. 5 (Naval) Squadron, like the other D.H.4 squadrons, gave up high bombing on this day and made five raids on troops and transport in the Somme area, the attacks being delivered from between 800 feet and 2,000 feet.

27-28
March

There were a few offensive patrols on both the Third and Fifth Army fronts, but little fighting resulted as enemy aircraft had, like ourselves, deserted the upper air and were chiefly active against the Royal Flying Corps low-flying aeroplanes, particularly between Albert and the Somme. The numbers of rounds fired from aircraft machine-guns against ground targets on this day (313,345) and of bombs dropped by night and day (50 tons) were the highest for the battle.¹

The orders to No. 101 Squadron for night-bombing on the 27th/28th of March stated: 'The enemy have been attacking all day between the river Somme and Rosières and will without doubt send up reinforcements in personnel and material during the night through Péronne and along the main Péronne-Amiens road. As it is most important to hamper this as much as possible, you will bomb Péronne and the bridge over the river Somme at Brie throughout the night.' No. 102 Squadron, to hamper the movements north of the river, was given the target of Bray and the neighbouring roads and villages. No. 83 Squadron and one Flight of No. 58 from Auchel (Lozinghem) had orders to bomb the main roads round Bapaume, while the two Flights of No. 58 at le Hameau were to attack the same area, but also to extend their attacks southwards to Bray-sur-Somme. The night was stormy, but 840 bombs were dropped on these various targets, and over 18,000 rounds of ammunition fired. Pilots of No. 101 Squadron found great activity in Péronne and made many direct hits on columns of transport. A large tent encampment near the town, showing lights, was hit and partly set on fire, and a dump at Estrées-en-Chaussée, east of Brie, was also fired by a direct hit and blazed throughout the night.

In the morning of the 28th of March, after a short intensive bombardment, the enemy widened his front of attack and launched a series of assaults at Arras, much

¹ The approximate figures are: 21st of March, 21,000 rounds of ammunition against ground targets and 15½ tons of bombs; 22nd, 41,000, 21 tons; 23rd, 44,000, 23 tons; 24th, 82,000, 36½ tons; 25th, 92,000, 33 tons; 26th, 228,000, 29 tons; 27th, 313,000, 50 tons; 28th, 242,000, 40 tons.

on the lines of his initial attacks on the 21st. But there *28 March* was, this time, no fog to impede the defence, and great losses were inflicted on the German troops who failed to penetrate the battle positions. A second series of attacks in the late afternoon north of the Scarpe were everywhere repulsed. In beating off the German assaults, the infantry were helped by the air observers of the Corps squadrons and of the balloon sections of the First Army. Many wireless calls for fire on massed German infantry were answered by the artillery, and some of the attacks were consequently disorganized before they reached the British lines.¹

The Arras attack involved the extreme right of the First Army as well as the left of the Third Army. The fighter squadrons of the I Brigade, working with the First Army, were therefore concentrated on low-flying attacks in the Arras area. The attacks were kept up most of the day by the 'Camels' of No. 4 (Australian Flying Corps) Squadron and No. 3 (Naval), the S.E.5a's of Nos. 1 (II Brigade) and 40 Squadrons, and the D.H.4's of No. 18 Squadron, while No. 2 (Australian Flying Corps) Squadron provided S.E.5a escorts for the low flyers. S.E.5a pilots of No. 40 Squadron, who left at 1.30 p.m. to patrol the area of Arras, found the main Arras-Cambrai road and most of the side roads full of troops and transport, with the Douai main roads similarly congested. These targets were attacked from heights down to 300 feet and panic and stampedes were reported. These troops were presumably moving forward to take part in the attack which developed north of the Scarpe in the late afternoon. Elsewhere on the Third Army front low-flying attacks on the Albert-Bapaume road were made by twenty reinforcing aeroplanes of the II Brigade, and on Bapaume itself by D.H.4's of No. 57 Squadron. The Corps squadrons of the Third

¹ The General Staff War Diary of the XVII Corps—the centre of the three British Corps engaged—records: 'From reports subsequently received it appears that our machine-gun fire caused great loss to the enemy; our aeroplanes also sent down many calls to the artillery against enemy in mass formations, and the artillery fire undoubtedly caused considerable loss.'

28 March Army kept to their normal Corps work, but five of the army squadrons were used specifically for attacks on ground targets in the area between Courcelles-le-Comte and Bray-sur-Somme. The repulse of the determined attacks at Arras marked the end of the main battle north of the Somme.

South of the Somme, however, the fight for the possession of Amiens was intensified. During the night of the 27th/28th German troops had worked southwards across the Somme and had reached the Amiens-St. Quentin road. With daybreak a general assault on the Fifth Army and on the French began, and a wide withdrawal along the whole front followed.

The fighting squadrons of the head-quarters Ninth Wing were diverted south of the Somme, while the head-quarters day-bombing squadrons were ordered to keep up a bombardment of Péronne and Chuignolles (north-east of Proyart) and of the roads in their neighbourhood. Accordingly No. 25 (D.H.4) Squadron dropped twenty-eight 112-lb. and one hundred and sixteen 25-lb. bombs and fired 7,000 rounds of ammunition, and No. 27 (D.H.4) Squadron dropped forty 112-lb. and fifty-six 25-lb. and fired 11,000 rounds of ammunition against targets of troops and transport at Péronne, Chuignolles, and on the roads between, and on the roads north-westward of Chuignolles towards Albert. The fighter squadrons of the Wing operated against ground targets mainly southwards from Cérisy-Gailly.

The orders for the Fifth Army Corps squadrons (Nos. 35, 52, and 82) were for at least one aeroplane to be on the line for contact-patrol work throughout the day between the Somme and Rosières. After this duty had been provided for, the Corps squadrons were to put their maximum effort into bombing and machine-gun attacks of enemy troops. 'It was on this day,' said a report of No. 52 Squadron, 'that an extraordinary number of enemy troops were reported and our machines had a field day attacking columns in fours. Heavy casualties were inflicted on several enemy battalions on roads near Damery, Becquigny, and Montdidier, and on deploying enemy infantry near

'Warfusée-Abancourt.¹ 112-lb. bombs were dropped on 28 March 'the Somme bridge at Cérisy-Gailly and a party repairing 'it destroyed.' No. 82 Squadron maintained a careful watch along the Fifth Army front and on the left of the French front, and their reports kept the army staff informed of the progress of the withdrawal. A typical report of this squadron, interesting for the episode of the coming into action of the British guns, may be given. The pilot was Captain E. R. H. Pollak and the observer Second Lieutenant F. L. Pascoe. 'At 11.15 a.m.,' the report reads, 'our troops seen advancing north taking up a position 500 'yards north of Marcelcave station in 3 lines and in large 'numbers. Large number of troops retiring from Bois de 'Pierret in good order. Limbered wagons still moving 'about west of Wiencourt-l'Equipée. Many enemy seen 'in open east of Lamotte. Dropped eight bombs and fired '400 rounds on them. These troops in thick formation 'south of road seemed to be trying to advance. Dropped 'message on three batteries by railway south of Villers-Bretonneux aerodrome, and on two batteries at Bois de 'Hamel, giving information and position of enemy. These 'batteries had only one or two men per gun who halted 'and went into action.' Low-flying attacks on the Fifth Army front were made chiefly by Nos. 24 and 84 (S.E.5a) Squadrons, and by D.H.4's of No. 5 (Naval) Squadron. Pilots of the last-named squadron dropped four 112-lb. and two hundred and sixty 25-lb. bombs on troops and transport at Proyart, Cérisy-Gailly, and on the Amiens-St. Quentin road.

There was very little air fighting on the 28th. Large enemy formations were reported from time to time over the Third Army front, flying higher than they had been doing for some days, but they seemed to avoid combat

¹ The German 4th Guards Division attacked, in the afternoon, in the area of Warfusée-Abancourt with the German 1st Division, with the object of capturing Hamel. The enemy attacks were beaten off. 'The intention', says a history of the German 4th Guards Division, 'to capture the hostile 'positions before dark, after a short artillery preparation, was not successful 'as the preparatory fire was insufficient. It is true that the artillery had 'been able to bring up part of their guns, but the replenishment of ammunition broke down owing to bombardment by the enemy's aeroplanes.'

28 March whenever they could. Seven German aeroplanes were destroyed during the day. The Royal Flying Corps casualties were high, but were nearly all due to fire from the ground. Seventeen aeroplanes were missing (with twenty-five officers), thirty-five were wrecked, and six burnt or abandoned.

By the evening of the 28th of March the troops south of the Somme had been withdrawn to the Amiens defence line from Mezières to Ignaucourt and Hamel. On this day, which marked the end of the critical fighting, Sir Hubert Gough and the staff of the Fifth Army were, by order from London, relieved of their duties, and the command of the British troops south of the Somme was taken over by General Sir H. S. Rawlinson with the staff of the Fourth Army, at this time in reserve.

It has been possible, in this history of the part played in the battle by the air squadrons, to give no more than an outline of the fighting on the ground, but that fighting has had to be studied in some detail, together with the general concentrations, strategy, and tactics of the battle. The air historian follows a battle from above rather than from a seat at head-quarters, a method of approach which may have disadvantages, but has the merit that the broad sweep of the battle can be seen in fair perspective. Thus followed, the fighting and movements of the Fifth Army, hopelessly weak in numbers for the task it was called upon to perform, and handicapped by inadequate communications and unfinished rear defences, offer nothing for censure, but much for wonder. It may be predicted that when all the facts have been made known and studied, and the last word has been said, the retreat of the Fifth Army will be the subject of a glowing page in military histories.

On the 29th of March the greater part of the British line south of the Somme was held by the new Fourth Army, that is to say, by Carey's force, by the 1st Cavalry Division, and by such troops of the Fifth Army divisions as had not yet been withdrawn.¹ German pressure began in the morning south of the Luce river. On the right

¹ The Fifth Army ceased to exist officially on the 2nd of April 1918, but was reconstituted in May.

of the British line, the French were vigorously attacked²⁹⁻³⁰ and driven from Mezières, but in the neighbourhood of^{March} Montdidier retained their captures of the previous day.

The weather which had prevented any night bombing continued stormy on the morning of the 29th, but when it improved in the afternoon, low-flying attacks were concentrated on enemy troops between the Somme and Hangest where squadrons of the V Brigade dropped a total of one hundred and eighty-nine 25-lb. bombs. The activities of the head-quarters squadrons were also centred in the area south of the Somme. While the fighting squadrons made low-flying attacks, the two day-bomber squadrons, Nos. 25 and 27, dropped twenty 112-lb. and fifty 25-lb. bombs on troops and transport in the areas Warfusée-Abancourt-Guillaucourt and Fresnoyen-Chaussée-Mezières.

On the night of the 29th/30th Nos. 58 and 83 Squadrons bombed the main roads in the neighbourhood of Bapaume (twenty-seven 112-lb. and two hundred and sixteen 25-lb. bombs) and No. 58 Squadron also attacked traffic on the Arras-Cambrai road (five 112-lb. and one hundred and fifty-three 25-lb. bombs). The orders for No. 101 Squadron (V Brigade) were for concentrated attacks on sectors of the St. Quentin-Amiens and Roye-Amiens roads where movements had been reported during the day. Owing to bad weather conditions only one aeroplane was able to operate and bombed the Roye-Amiens road (three 112-lb. bombs). No. 102 Squadron dropped nearly four hundred bombs along and about the Arras-Cambrai road. During the same night Quiéry-la-Motte, west of Douai, was attacked by Nos. 2 and 5 Squadrons.

On the morning of the 30th air reports told of strong German movements in the valley of the Luce¹ where a series of determined infantry attacks were made during the

¹ One long German column was seen on the Villers-aux-Erables-Moreuil road. Says the history of the German 101st Regiment: 'From early morning of the 30th, the march of the 243rd Division on the Villers-aux-Erables road towards Moreuil was in progress. The dense columns 'attracted numerous squadrons of airmen which attacked with bombs and 'machine-guns.'

30 March day. The fighting was confused, but, by the end of the day, the line had been little altered. The operation orders issued to the Corps squadrons of the V Brigade for the 30th said: 'It is of the utmost importance that the enemy 'should be held on his present line for at least another day; 'a vigorous offensive action with bombs and machine-gun 'fire at ground targets will therefore be pursued.' The three Corps squadrons (Nos. 35, 52, and 82), in addition to contact-patrol and reconnaissance flights, obeyed the spirit of these orders by dropping one hundred and nine 25-lb. bombs and firing 17,000 rounds of ammunition against German troop concentrations. No. 2 (Australian Flying Corps, S.E.5a) Squadron, and No. 65 ('Camel') Squadron which had been transferred to the V Brigade, assisted Nos. 24, 84, 23, 48, and 54 Squadrons in their attacks on troops on the Amiens-Roye road particularly, and south of the Somme generally, while No. 5 (Naval) bombed troops and transport east of Villers-Bretonneux. In addition, the head-quarters squadrons were once again concentrated in this area south of the Somme. The fighters were given the general front Hamel-Marcelcave-Mezières, and the bombers the villages of Caix (thirty-four 112-lb. and thirty-two 25-lb. bombs by No. 27 Squadron), and Fresnoy-en-Chaussée, Bayonvillers and Chuignolles (thirty-two 112-lb. and one hundred and twenty-eight 25-lb. bombs by No. 25 Squadron). An example of the effect of the low-flying attacks on the 30th is given in the German history of the 122nd Regiment. 'The French and British flying men circle over 'Moreuil Wood and join in the battle, attacking with 'bombs and machine-gun fire. . . . A pair of British 'aviators pass at such low height over the wood that one 'expects them to hit the tree-tops. They have dropped 'their bombs and used their machine-guns, and now, flying 'at the speed of arrows, attack our batteries. . . one bomb 'dropped from a negligible height places the whole staff of 'the 1st Battalion *hors de combat*. Moreuil Wood is a hell.'

The weather was too stormy for the night-bombing of the enemy communications ordered for the 30th/31st. It was still overcast and showery after daybreak, but

air observers in the morning reported German troops *31 March* massing for attack north of Démuin, while farther east there were trains in the station at Rosières-en-Santerre and considerable activity in the village. East of Villers-Bretonneux, at Wiencourt-l'Équipée, German reinforcements were seen detraining. Later in the day the air reports told of considerable movements of troops and transport on the Roye-Amiens and St. Quentin-Amiens roads. The morning passed comparatively quietly along the front, but in the afternoon a series of strong attacks developed between Démuin and Moreuil, and on the French as far south as Montdidier. After heavy fighting the enemy made some progress, but counter-attacks partly restored the position. At 2.15 p.m. an observer of No. 82 Squadron watched 2,000 German infantry moving to attack along the edge of a small wood south of Moreuil. He sent out several wireless calls to the artillery, but before any reply was made, he had seen the enemy troops begin to open out, east of the wood, into attacking formation. Then came replies to his calls and shrapnel fell thickly on the advancing Germans, and the attack was never made.

The 31st of March was notable for the partial return of the fighting and (D.H.4) bombing squadrons to the upper air. The supreme emergency, which had alone brought them down to play a direct part in the fighting on the ground, was ending. Furthermore, the enemy pilots on the 28th, and again on the two subsequent days, although their activity had been curtailed by bad weather, had shown signs of a return to their normal fighting heights, and to large formations.

On the V Brigade front, where the German columns were reported moving west, and where infantry attacks developed in the afternoon, the Corps squadrons and the fighter squadrons were still mainly concerned with bombing and shooting at the German troops. No. 5 (Naval) Squadron bombed from heights between 1,000 and 8,000 feet in the morning, the targets being huts, billets, troops, and transport east of the front of attack, but in the afternoon, when Caix and Rosières-en-Santerre

31 March were attacked, the D.H.4's flew at 11,000 to 12,000 feet. One of the head-quarters bombing squadrons also had targets in the V Brigade area. This was No. 27, which attacked, from 12,000 feet, Villers-Carbonnel on the St. Quentin-Amiens road and Foucaucourt village. Elsewhere, the main bombing was from a height, notably against Bapaume by Nos. 57 and 25 Squadrons and, in the Lens area, against Henin-Liétard by No. 18 Squadron.

The operation orders issued for the Ninth Wing fighting squadrons stated: 'Patrols will work on the front between the river Somme and Mezières. All efforts will be concentrated on attacking hostile machines and not on ground targets as of late. The concentration of force at such hours as the enemy is likely to be active will be aimed at, rather than continuous but weak patrols throughout the day. Patrols forming the first concentration will cross the line at 9 a.m. Times of other concentrations are left to the discretion of O.C. Ninth Wing in accordance with the enemy's aerial activity. Patrols will work at a height if the weather is fine, but even if forced by the weather to work at a low altitude, their objectives will be the enemy's machines and not ground targets.'

Eight offensive sweeps were made by formations of the Ninth Wing during the day, but there were no encounters with the large enemy formations which appeared intermittently over the battle area, and there was only one successful combat. On the whole British front on this day there were no more than three decisive combats. Many of the fighter pilots, finding no aeroplanes to attack, went down low and attacked ground targets.

On the night of the 31st of March/1st of April there was considerable bombing of enemy communications. No. 101 Squadron was given objectives on the Amiens-Roye road where German troop concentrations (estimated at two divisions) had been reported from the air, and on the St. Quentin-Amiens road. Bombing by F.E.2b's of this squadron was kept up for ten hours and many direct hits on the billeting villages were made with the seventy-eight 112-lb. and one hundred and fifty 25-lb. bombs. At

5.30 a.m. just as the last F.E.2b was landing, a bombing attack on No. 101 Squadron's aerodrome was made by German pilots who had apparently followed the F.E.2b back from the lines. The bombs killed one officer and two men, wounded two others, and wrecked four aeroplanes. Air reconnaissances made on the 31st of March showed that the train movements on the Douai-Valenciennes-Cambrai lines were towards Cambrai where the station sidings were seen to be filled with traffic. Cambrai, therefore, as well as the stations at Douai and at Dechy, the railway triangle south of Douai, were heavily attacked during the night by the two head-quarters squadrons (58 and 83) and by the four Corps squadrons of the I Brigade (2, 4, 5, and 16). No. 102 Squadron dropped 400 bombs on transport and targets indicated by lights, continuously through the night, at Bapaume, le Transloy, and Achiet-le-Grand and on roads in the neighbourhood.

On the 1st of April there was little activity on the ground, but a great amount of air fighting, most of it at low heights. The offensive sweeps made on the previous day in the upper air had had no encounters and the orders for the Ninth Wing fighting squadrons for the 1st of April stated: 'Patrols will work at a low altitude, their first objective being hostile machines, and their second, ground targets.'

Counter-attacks by the 8th Division and by the 2nd Cavalry Division, which restored part of the line near Moreuil, were accompanied by low-flying aircraft of No. 84 Squadron. Other low-flying pilots of the six fighter squadrons with the V Brigade (23, 24, 48, 54, 65, and 84) kept up their attacks during the day. One of the German regiments which was attacked—the 114th—records: 'Shortly after 9 a.m. heavy artillery fire starts. Numerous airmen attack with machine-gun and bombs and cause our line considerable losses. The fire is followed by an English counter-attack . . .' The Ninth Wing fighter squadrons were again given a patrol line on the front south of the Somme. Formations were ordered to work at low altitudes between Aubercourt and Aubvillers, 'their first objective being hostile machines, and their second, ground

1 April 'targets'. The activities of the squadrons during the day extended beyond this area, going as far south as Montdidier and east to Caix, but were centred chiefly about Moreuil. Many German aeroplanes were encountered from time to time and two were destroyed by Ninth Wing pilots. Two other enemy aeroplanes were shot down on this front and six on the fronts of the Third and First Armies.

No. 205 Squadron—as No. 5 Naval was now called¹—made two raids during the 1st of April on the villages of Caix and Rosières-en-Santerre and the near-by aerodrome, their four 112-lb. and one hundred and ninety-two 25-lb. bombs being dropped from 12,000 feet. Caix, Roye, Cérisy-Gailly, Péronne, and Buire were the targets for No. 27 head-quarters Squadron, but No. 25 Squadron was chiefly engaged on the 1st on photographic reconnaissances of distant centres.

North of the Somme, No. 57 Squadron made three attacks on Bapaume. From the II Brigade area, No. 206 (D.H.4) Squadron, newly transferred from Dunkirk, attacked Menin station.² The station at Cambrai, where great activity was again reported, was the objective of four bombing D.H.4's of No. 18 Squadron.

The British air casualties on the 1st of April were comparatively heavy. Ten aeroplanes were missing, thirty-eight wrecked (eight of these on the Second Army front), and four were destroyed as a result of the German bombing raid to which reference has already been made. Of the ten missing aeroplanes, seven were engaged on offensive patrols, two were lost while bombing Bapaume, and one was out on reconnaissance. Of the thirty-eight wrecked, twelve had suffered severe damage through enemy anti-aircraft or rifle and machine-gun fire. The remainder were wrecked through forced descents owing to engine failure,

¹ When the Royal Air Force was formed on the 1st of April, all former Royal Naval Air Service Squadrons had 200 added to their existing numbers.

² The II Brigade was reinforced by two squadrons from Dunkirk, namely, No. 209 (Sopwith 'Camel') Squadron on the 28th of March 1918, and No. 206 (D.H.4) Squadron on the 31st.

or through faulty landings. The high percentage of casualties due to accidents reflects something of the strain under which pilots were flying, but it should also be remembered that the temporary aerodromes, which were frequently changed during the retreat, were, although the best available, often unsuitable.

During the night of the 1st/2nd of April the bombing was again directed chiefly against the enemy railway communications. Nos. 58 and 83 Squadrons, as on the previous night, attacked Douai, Dechy, and Cambrai (twenty-six 112-lb. and two hundred and ten 25-lb. bombs). An attack on Valenciennes, ordered for the previous night, was attempted on the 1st/2nd by four Handley Pages of No. 214. Only one aeroplane got through to the objective, under bad weather conditions, and dropped fourteen 112-lb. bombs.

While these attacks on railways were in progress, three F.E.2b's of No. 102 Squadron bombed lights and lighted transport in the area Arras-Cambrai-Bapaume, and fourteen pilots of No. 101 Squadron, with roving commissions, bombed roads and villages south of the Somme.

Cambrai, Douai, and Dechy were again heavily bombed on the 2nd of April—a day on which, for the first time since the battle opened, there were no infantry attacks in the Somme area. No. 27 Squadron bombed Douai and Dechy, and No. 25 attacked Cambrai. The Cambrai rail-head was also the objective for nine D.H.4's of No. 18 Squadron (I Brigade). Don railway station was twice bombed by No. 206 Squadron with one hundred and thirty-eight 25-lb. bombs. Further attacks on railway traffic were made by 'Camels' of No. 4 (Australian Flying Corps) Squadron. Pilots of the squadron made two raids. In the first, between 6.50 a.m. and 7.5 a.m., sixteen 'Camels' took part in an attack on the railway near Drocourt and on billets near Oppy. In the second, at midday, fourteen 'Camel' pilots bombed Drocourt again, and also Harnes.

The fighting patrols of the head-quarters squadrons took place chiefly, as ordered, south of the Somme, and ground targets were attacked during these patrols notably by

No. 32 (S.E.5a) Squadron. A warning in the orders said: 'It 'may be necessary to switch patrols on to the Arras front.' But the expected attack on the Arras sector did not take place on the 2nd and most of the air combats were fought south of the Somme, although enemy airmen were fairly active in the neighbourhood of Albert and in the Ancre area. Of the eleven German aeroplanes destroyed on the 2nd of April, eight were shot down south of the Somme.

On the 2nd of April Royal Air Force head-quarters in France received General Foch's instructions (dated the 1st) for the employment of the British and French air services in the battle area. A translation of these orders, the first of their kind, is given as Appendix XVIII. They show a strategic mind surveying the whole battle area, irrespective of boundaries. Of particular interest are the ideas underlying the general instructions for bombing and for the employment of fighting aircraft. 'The *'essential condition of success'*, he said, 'is the concentration of *every resource* of the British and French 'bombing formations on such few of the *most important* of 'the enemy's railway junctions as it may be possible to put 'out of action with certainty, and to keep out of action. 'Effort should not be dispersed against a large number of 'targets, some of which might be remote from the battle 'area and therefore difficult objectives for sustained and 'effective attack.' The British were asked to concern themselves with the destruction of the stations at Péronne, Cambrai, Aubigny-au-Bac and Douai.

With regard to fighting aircraft it was stated: 'At the 'present time the first duty of fighting aeroplanes is to 'assist the troops on the ground by incessant attacks, with 'bombs and machine-gun, on columns, concentrations, or 'bivouacs. Air fighting is not to be sought except so far as 'necessary for the fulfilment of this duty.' (*'Le combat 'aérien n'est à engager que dans la mesure nécessaire pour 'permettre l'accomplissement de cette mission.'*¹)

¹ General Fayolle's orders, issued on the 28th of March, had included a similar instruction, viz.: 'En ce moment, le combat aérien n'est pas à 'rechercher. Il ne sera engagé que dans la mesure nécessaire pour permettre 'l'accomplissement des missions ci-dessus' [that is, low-flying attacks and

It was further stated that, in the event of important *2 April* operations confined to the front of one of the Allied Armies, there might be a question of calling for help from the aircraft service of the other. In other words, General Foch was obviously concerned, for the future, with real strategic aircraft concentration, irrespective of national divisions, on any vital part of the front.

The Foch memorandum raises some pertinent questions. The instructions were well conceived and inspired by strategic insight, but it is impossible to see how they could have been properly obeyed, in the letter or in the spirit, with the existing divisions in the direction of the air resources of the Allied Armies. The logical conclusion should have been the appointment, under General Foch, of an inter-Allied air officer to command all offensive aircraft, that is, all fighters and bombers. Such an appointment would have made it possible to organize a real strategic reserve which could have been concentrated, as occasion demanded, on any vital stretch of front. It was largely because the Germans had this unity of direction that they were able, with a far smaller air service than was available to the Allies, to obtain the maximum effect, according to the changing needs of the battle-front, from their comparatively slender resources. It is not too much to say that the Allied superiority in aircraft was largely discounted by the failure to follow the elementary principles of concentration, or, in other words, that a great Allied advantage was dissipated through divided direction. Figures are available which give sharp point to this argument. On the day that General Foch issued his memorandum, there were, opposed to the British along the battle-front south of Arras, 822 German aircraft as against 645 of the Royal Air Force. That is to say, in the actual battle area, the enemy enjoyed numerical superiority in aircraft. North of Arras, a total of 185 German aeroplanes (excluding naval aircraft in the coast area) were opposed to

reconnaissance]. But it is significant that another order of General Fayolle, issued on the 1st of April, stated that, owing to a considerable increase in German air activity, it would be necessary for the fighting aircraft to seek battle to ensure the retention of air superiority.

2-3 April 1933 British (also excluding Dunkirk naval aircraft), but it must be pointed out that many of the Royal Air Force squadrons, especially fighting squadrons, immediately north of Arras, were used almost exclusively over the front of the Third Army.¹ The best available figures give the French, on this day, a total of about 2,000 aircraft with no more than 367 German aeroplanes opposite them.² Thus, although the Germans along the whole Western front were outnumbered, in aircraft, by nearly 3 to 1, they had a nominal superiority on the active battle-front of nearly thirty per cent. It may be argued that the actual superiority was less pronounced because some of the British aircraft in the north, and, also, some of the French aircraft in the south, covered a part of the battle area, but it should be remembered that German aircraft on the flanks similarly participated in the battle. In any case, the general significance of the figures is unaffected.

On the night of the 2nd/3rd of April the weather was bad and made bombing difficult. No. 58 Squadron again attacked Dechy station and the railway triangle to the west, and claimed direct hits. No. 83 Squadron, however, was unable to bomb the allotted objective of Cambrai. No. 102 Squadron and two Corps squadrons of the I Brigade (Nos. 2 and 4) attacked railway communications. No. 102 bombed St. Léger, where a train caught fire and burned for some hours, and the villages of Croisilles, Mory, and Ervillers. No. 101 Squadron, south of the Somme, attacked billeting villages and troops on the Amiens-Roye road (eight 112-lb. and one hundred and ten 25-lb. bombs).

The 3rd of April passed comparatively quietly on the ground, and rain and low clouds hampered flying. Cambrai, Douai, Dechy, Don, and Bapaume stations were

¹ The figures for the Royal Air Force do not include three squadrons at that moment shown as in Royal Air Force head-quarters reserve, namely, Nos. 74, 41, and 6—a total strength of fifty-two aeroplanes.

² For a statement of the German air strength opposed to the French, see Appendix XVI, Table B. In the area of the French armies, at Ochev, was also the Forty-first Wing of the Royal Air Force whose duty was the bombing of military targets in Germany. At this time the Wing disposed of a total of forty-six aircraft.

again the main bombing objectives. Enemy aircraft ^{3 April} activity was, generally, below normal, but showed a distinct change in kind. Massed German formations, flying at high altitudes, made their appearance over the battle-field. The Royal Air Force offensive patrols were still being made at low heights, but an enemy formation of some thirty Albatros and Pfalz Scouts came down from the upper air on one occasion in the morning and sought combat with British patrols totalling twenty-seven 'Camels' and S.E.5a's of Nos. 65 and 84 Squadrons. The encounter, which began at 1,500 feet, was fought out for about an hour over the German advanced landing-ground near Rosières. The record book of No. 84 Squadron says that at the end of that time the British formations 'were left in possession of the sky'. Five German aeroplanes had been destroyed, in flames or crashed, and many others had left the fight. The British pilots came from the conflict unscathed and all returned safely to their aerodromes.

As a result of this change in German air tactics, there was a radical alteration of the British air offensive patrol policy, especially important in view of the direction in the Foch memorandum that the task of fighting aircraft was to support the ground troops and that only such air fighting was to be sought as ensured this support. The operation orders, issued to the Ninth Wing on the evening of the 3rd of April for the following day, stated: 'Enemy aircraft have been very active to-day on the 5th Army front, flying in massed formations at high altitudes. A large number of them were destroyed by the V Brigade. Officer Commanding Ninth Wing will detail all available machines as offensive patrols to-morrow. Patrols will consist of machines of not less than two squadrons to patrol continuously the line Bray-sur-Somme to Caix between the hours of 11 a.m. and 4 p.m. At least $\frac{1}{4}$ -hour overlap will be allowed for, between patrols. Formations must be rigidly maintained. The whole object of these patrols is to seek out and destroy enemy formations.' The weather on the 4th made it impossible for effect to be given to these orders, but they may be said to mark a stage in the development of air warfare on the Western front.

3-5 April Henceforth, fighting formations of three or four squadrons, closely supporting one another, were to become fairly common.

Rain and clouds prevented bombing during the night of the 3rd/4th of April, and again made flying difficult on the 4th, but on this day the Germans made their final thrust south of the Somme and many flights were attempted in spite of the weather conditions. The enemy infantry attacked the British and French line in dense formations and offered outstanding targets. The German advance against the British began at 7 a.m. and was renewed in the afternoon. Flying in the morning was impossible owing to mist and rain, but about noon the conditions improved a little and a Corps observer was able, from a low height, to plot part of the line. In the afternoon, pilots of the V Brigade made many attacks on the enemy infantry. Visibility was very circumscribed and the attacks, both by the fighters and by the Corps aeroplanes, were made from heights down to 100 feet or less. Elsewhere along the British front little flying was attempted on the 4th of April.

Orders issued to the Fifty-first Wing fighters for the 5th of April included a patrol by three squadrons of the line Bray to Caix from 2.30 p.m. to 4 p.m. Each squadron was to provide twelve aeroplanes, which were ordered to keep rigid formation, and the squadrons were instructed to work together. It was again stressed that this was to counter the new enemy tactics of massed formations at high altitudes.

The enemy had made little progress on the 4th and his attacks had proved costly, but on the 5th, in a last effort to prevent the line from becoming stabilized, the attacks were renewed north and south of the Somme. South of the river, British and French troops were severely engaged throughout most of the day, but the line did not yield. North of the Somme, where the main German effort was made along almost a continuous front from Dernancourt to beyond Bucquoy, a little ground was lost, but at a cost to the enemy of disproportionate casualties. Once again there were very low clouds and rain, and there was

little flying: some attacks were made on enemy troops in the two battle sectors on both sides of the Somme, and a total of two hundred 25-lb. bombs were dropped and over 20,000 rounds of machine-gun ammunition fired.

With the failure of the German attacks on the 5th of April, the Somme offensive came to an end. This is not to say that fighting ceased. The line, especially between Albert and Montdidier, only settled down slowly and the process of stabilization was marked by sporadic outbursts of local activity.

Aerodrome and Supply Organization

One of the major problems of the Royal Flying Corps staff during the retreat had been the provision of aerodrome accommodation, and the transportation and maintenance of squadrons. The possibility of a withdrawal to the battle zone and, ultimately, to the rear zone of defence, had been contemplated, and aerodromes had been made to which the squadrons could move back. On the urgent representation of Major-General J. M. Salmond, also, the transport available to the squadrons had been increased,¹ and detailed emergency allotments of lorries and trailers to squadrons and kite-balloon sections had been made.

The weight and success of the German offensive, however, exceeded anything for which allowance had been made. No such retreat, either in rapidity or extent, as the Third and Fifth Armies were compelled to make, had been contemplated. Many aerodromes came under shell-fire on the opening day of the attack, and it was not long before the

¹ In September 1917 part of the transport with squadrons had been withdrawn, and Reserve Lorry Parks had been formed in each Royal Flying Corps Brigade. The establishment for these parks of thirty lorries and twenty-four trailers had been based on the assumption that half the squadrons in the Brigade might have to move at any one time. No arrangement had been made for an increase in the transport to conform with increases in the numbers of squadrons in Brigades. Major-General Salmond took up the question, in February 1918, of an increase in the strength of each Reserve Lorry Park, by an additional section of fifteen lorries and twelve trailers, and for the provision of a special Lorry Park for head-quarters, and his foresight and insistence were rewarded once the retreat began.

German advance had overrun the aerodromes behind the rear zone. It will be recalled that No. 6 Squadron had been engaged throughout the winter in giving instruction in methods of aircraft co-operation to army officers. When the battle began, the squadron, which had no observers, was ordered back from Bertangles to le Crotoy, at the mouth of the Somme, to be out of the way. The squadron commander, however, Major A. W. H. James, was given the task of finding new aerodromes. Each night, at midnight, Brigadier-General P. W. Game, at Royal Flying Corps head-quarters, went over all the situation reports with Major James and decided what squadrons would be required to move next day, and the areas within which aerodromes must be found for them. About an hour before dawn Major James set out by fast car to prospect for suitable landing-grounds in the allotted areas, and when he had made his choice, he put a priority call through to Brigadier-General Game, and gave the map references. Royal Flying Corps head-quarters then telephoned to the nearest aircraft park, or other air unit, and gave instructions for the marking out of the ground. Later, special aerodrome officers were appointed to survey back areas for suitable landing-grounds, and aerodrome construction parties were assembled (some of them from England) and sent to selected sites with portable hangars and tents. Under authority from General Head-quarters land was occupied without the usual formalities of hiring or leasing. The construction parties, who worked at great pressure, did the minimum necessary in the way of removing obstruction to make the landing-grounds serviceable and, by the 5th of April, had made forty-five new aerodromes.

A more serious problem, in the conditions of upheaval, was the maintenance of squadrons in aircraft, petrol, oil, ammunition, personnel, and general equipment. The problem was complicated by the fact that the Aircraft Parks which supplied the air units of the Third and Fifth Armies had to go on the move soon after the battle began. It was made critical when it was deemed necessary to move No. 2 Aircraft Depot at Candas, and No. 2

Aeroplane Supply Depot at Fienvillers, on which the whole of the aircraft supply system in this area depended.

Supplies were the responsibility of Brigadier-General H. R. M. Brooke-Popham, the Deputy Quartermaster-General at Royal Flying Corps head-quarters. His first concern was to ensure that petrol, oil, bombs, and ammunition, were made continuously available on all landing-grounds. As soon as a new aerodrome was taken over these stores were dumped so that when the aeroplanes landed there need be no delay in the operations while the pilots were waiting for their squadron transport which often, owing to the congested state of the roads, was delayed for hours, and, sometimes, for days. One scheme, which Brigadier-General Brooke-Popham initiated, was the formation of two convoys of eight light tenders each, with specially selected drivers. The tenders of one convoy were kept loaded with machine-gun ammunition and with 25-lb. bombs, and could move off, day or night, at five minutes' notice. The second convoy was available to rush off at any time with spare parts urgently required by the air units with the Third or Fifth Armies or with the head-quarters Ninth Wing.

There was no difficulty about the supply of new aeroplanes to make good the losses and, under a special arrangement, these aeroplanes were flown to the squadrons, whenever necessary, by pilots required to replace casualties. The source of supply in the southern area was No. 2 Aeroplane Supply Depot at Fienvillers. On the 25th of March, when the position on the battle-front was very grave, this depot, together with the nearby Aircraft Depot at Candas, began to pack up. The two sections of the Fienvillers depot separated. The repair section went to Verton, near the coast, south of Étapes, and the issue section went to the Royal Flying Corps head-quarters at St. André-aux-Bois. The removal of the issue section meant the evacuation of about one hundred and seventy aeroplanes and it was only by chance that the last seventy were got away safely. Brigadier-General Brooke-Popham was at Fienvillers on the evening of the 27th giving general instructions for the final evacuation.

It was an unpleasant evening, gusty and with low clouds, and he gave orders that the remaining aeroplanes were to be flown to St. André-aux-Bois next morning. The officer in charge of the issue section, however, pleaded for permission to fly them away at once. Brigadier-General Brooke-Popham demurred because it was already late and the depot pilots, who would be required to make two trips, might be unable to complete their second journey before dark. The officer, however, was insistent and Brigadier-General Brooke-Popham yielded. All the aeroplanes were got away safely and that night the sheds in which they had been housed were heavily bombed by German aircraft and partly demolished. When the issue section moved, such aeroplanes as were immediately required by squadrons were left behind at Fienvillers for collection, and afterwards squadrons took over their new aeroplanes at St. André-aux-Bois.

No. 2 Aircraft Depot moved from Candas to an empty sugar factory at Rang du Fliers, south of Étaples, the evacuation beginning on the 25th of March. The stores depot at Candas was a vast organization which had developed continuously since the original No. 3 Aircraft Park had been formed there in July 1915. For nearly three years the buildings and workshops had been added to, the accumulation of stores had multiplied, and, indeed, the whole depot had acquired an efficient and systematized solidity that seemed to ignore any possibility of trench warfare giving way to a war of movement. It had been said that the evacuation of Candas would require ample time for careful preparation and unhurried transportation. In fact, all important stores were successfully moved under extreme pressure in a few days. The officers and men at the depot, with the help of personnel from the kite-balloon sections which had, on the 24th, been withdrawn from the Third and Fifth Army battle areas, worked night and day packing up: Squadrons of the III and V Brigades, and of the Ninth Wing, were told they could go into Candas, meanwhile, and take without indent any stores they were likely to require, and the depot staff were instructed to leave behind a sufficient stock of ammunition

and spare parts to meet all probable requirements of the squadrons for seven days. No. 2 Aircraft Depot finally evacuated Candas on the 30th of March, but a section of the Third Aircraft Park, which had moved from Puchevillers, took over, at Candas, the responsibility for the supply of ammunition and stores set aside by the depot to satisfy the immediate requirements of the squadrons.

The removal of the important depots from Candas and Fienvillers was in the nature of a precautionary measure. It could not be foreseen, at the time, when and where the German advance would be halted and no risks could be taken. Actually the advance was stopped before either Candas or Fienvillers was specifically endangered.¹ The uncertainties and confusion of the retreat and the consequent difficulties in the way of reorganizing the supply system are revealed by the instructions given to Brigadier-General Brooke-Popham. Until the appointment of General Foch there were doubts about the French intentions, and these doubts were reflected in the Royal Flying Corps organization. One day, Brigadier-General Brooke-Popham was informed that the Allied policy was to defend Paris; the next, that the British were to defend the Channel ports; yet again, that the main policy would be to keep touch between the Allied Armies irrespective of objectives. That the abandonment, if necessary, of the Channel ports was a possibility is shown by arrangements made by the Royal Flying Corps for a new route for aeroplanes coming as reinforcements from England. They were to take a line from Beachy Head to a landing-ground near Dieppe. Complete arrangements for the use of the Dieppe ground were made with the local authorities and they could have been put into force, had it become necessary, at a moment's notice.

An important effect of the removal of the depots from Candas and Fienvillers was the temporary cessation of repair facilities for damaged aircraft and engines of the

¹ Candas and Fienvillers continued to be used by Royal Air Force units up to the 6th of April, when they were handed over for use by troops of the Third Army, passing eventually to the French.

squadrons in the battle area.¹ Instructions were issued, on the 27th of March, that squadrons of the III Brigade and of the Ninth Wing were to send salvaged engines to the new depot at Rang du Fliers, but the squadrons were given the choice of dumping damaged aeroplanes at specified cross-roads, or of burning them. The squadrons of the V Brigade were ordered to salvage engines if possible for return to Rang du Fliers, but were told to burn their damaged aeroplanes. These orders meant, in effect, an ultimate loss of seriously damaged aircraft, but so smoothly did the improvised replacement organization work that all squadrons were kept well up to strength throughout the battle. A tribute must be paid to the non-commissioned officers and to the air mechanics of the squadrons, parks, and depots, on whom a great responsibility was thrown during the retreat. When all about them was uncertainty and confusion they proceeded, without fuss, to fulfil their duty of maintaining the squadrons as effective units, no matter how often or how much the situation changed. They took food and sleep as they could, and often went without both. In meeting and overcoming the multitudinous difficulties which a rapid retreat must always impose on a highly technical service, the mechanics revealed an initiative and adaptability in keeping with the traditions of their parent Corps—the Royal Engineers.

The work of the Royal Flying Corps in the German March offensive has been a subject of service controversy. The main point of contention has been the diversion of the activities of the majority of squadrons from their normal duties to a direct offensive against enemy troops. It has been said that the Royal Flying Corps missed a golden opportunity to assist the artillery, and that low-flying attacks by aircraft on troops, batteries, or transport, no matter how sustained or successful, could not compare with the effect of well-directed artillery fire on the same targets. This point of view may be conceded at once, and,

¹ Minor repairs were always made in the squadrons. The rule at this time was that squadrons were to effect repairs to aircraft which could be made serviceable again within thirty-six hours.

indeed, was continuously stressed by the Royal Flying Corps Command.¹ The fact is, the organization for co-operation between the artillery and the Royal Flying Corps frequently broke down. The reasons for this, as set out in a memorandum prepared after the battle by the staff of the Third Army, were stated to be:

- (i) Severance of telephone communication.
- (ii) Failure to receive wireless messages on battery masts owing either to loss of equipment or failure to erect aerials during constant moves.
- (iii) Battery ground stations located absolutely within the battery position with inadequate cover for wireless operators, the reception being rendered extremely difficult.
- (iv) All batteries being employed in bombardment or barrage as required by divisions and hence none being ready to respond when calls were received.

It is true that some of the Corps squadrons were out of touch with the artillery for long periods during the retreat and that, therefore, there could often be little prearrangement, particularly with regard to counter-battery work. The zone-call system, however, had been introduced primarily to meet conditions of open warfare. The use of the zone calls enabled an air observer to conduct an impromptu shoot on any fleeting or other important target, but the allotment of batteries to answer the calls from the air was a matter of artillery organization, and was in no way dependent on prearrangement between the Royal Flying Corps and the artillery. The majority of zone calls

¹ See paragraph 4 of the memorandum on the employment of the Royal Flying Corps in Defence (Appendix XIV). In Major-General Trenchard's original memorandum, before emendation, the point was more strongly emphasized. He said: 'Modern artillery plays such an important part in a defensive action that too much stress cannot be laid on the work of Corps machines. Counter-battery work without air observation is in most cases of very little value. The best way, therefore, in which the Flying Corps can assist at this period [i.e. when the attack has begun] is by assuring a continuance in the air of artillery machines. If this object can be attained it will be a far more effectual help to the infantry and artillery, though invisible to them, than any amount of low-flying or bombing against the enemy front-line troops.'

sent down from the air during the first days of the battle were not answered while the air observers were waiting to observe the fire effect. They may, sometimes, have led to fire after the aeroplane had finished its turn of duty and left the lines, but in such instances the fire could not be corrected and must, therefore, have lost much of its effect.

It is clear that the chief cause of failure was the breakdown of the artillery wireless organization. Batteries were continuously on the move. Much wireless equipment was lost, and when batteries halted they often could not or did not erect their wireless masts. Even when masts were erected, the operators were seldom aware of the zones covered by the guns of their battery. This lack of information made for delay and confusion. It was an essential part of the zone-call system that operators should be kept informed by the battery commanders of the calls they were to take, which were only those within the zones covered by the battery. While the batteries were on the move, these zones changed, of course, continuously.

The officer who commanded No. 8 Squadron during the retreat has recorded: 'I had been unable to find out 'the position of any of our batteries from the Corps on the 'night of the 21st/22nd, consequently early on the morning 'of the 22nd I went to see the G.O.C. Heavy Artillery, and 'the counter-battery staff officer, who were together. They 'were also unable to tell me the location of a single battery. 'Consequently I sent out my wireless officer with as much 'spare gear as possible, so as to be able to get battery 'stations working in cases where portions of the wireless 'equipment had been lost. He found several batteries, but 'not one with a mast in action. As soon as the retreat had 'started, all idea of co-operating with aeroplanes seemed to 'have been abandoned. Many batteries had simply thrown 'their wireless equipment away, others had retained the 'instruments only. The squadron wireless officer certainly 'did get many sets into action during the days of the retreat, but the trouble was that batteries remained such a 'short time in one position that the effect of his work did 'not last for many hours. Actually he told me that he had 'several times repaired and brought into action the set of

'the same battery, in successive positions. Under these 'circumstances little use was made of the zone calls which 'were sent down, the answering of which was probably the 'one hope the artillery had of effectively hindering the 'German advance.'

This experience, so far as can be judged, was typical of that of other Corps squadron commanders, except, perhaps, on parts of the Third Army front. It will be recalled that something similar had happened during the advance to the Hindenburg Line in March 1917. The Fourth Army Commander, General Sir Henry Rawlinson, in a report on this advance had then stated: 'Provision had 'been made for wireless stations to be taken forward, but 'units were slow in establishing them or neglected to do so 'altogether. On some occasions, therefore, opportunities 'for acting upon information derived by aeroplane observation and of inflicting losses on the Germans were missed.' Following this report, a General Head-quarters memorandum had been issued in which stress had been laid on the necessity for the rapid setting up of artillery wireless stations, but thereafter a long spell of trench fighting had tended to obscure the lessons applicable to moving warfare.

The impression, which seemed to be fairly widely held, that all squadrons, including those attached to Corps, were diverted partly or wholly to low-flying attacks, is not borne out by the facts. Contact-patrol work and close reconnaissances were maintained and, owing to the disorganization of ground communications, were of vital importance. The reports often gave the Corps staff the only information they received about the movements of their forward troops, and also kept them well informed of the enemy's advance. Artillery patrols were made, and many of the unique targets offered by the masses that made up the German advance—masses which made little attempt at concealment—were indicated to the artillery by wireless. Some of these calls were answered, but the majority, as has been indicated, met with no response. It was the surplus energy of the Corps squadrons that was expended in making bombing and machine-gun attacks. The fighting squadrons, however, and, as the battle developed, the bombing

squadrons also, were drawn more and more into making direct attacks on enemy troops and transport. The low-flying concentration reached its peak on the 26th of March when, as has been seen, no fewer than thirty-seven out of sixty squadrons with the armies on the Western front were employed, wholly or partly, on the menaced front of the Third Army. On this day the enemy had poured through the gap between Beaumont Hamel and Puisieux-au-Mont and, although the position was restored by counter attacks by Australian and New-Zealand troops, it was for a time one of extreme gravity. A reference to the map will reveal how the lines of communication of the First Army, north of the battle area, were endangered and how, in consequence, a rolling up of the British line had become a possibility. It was in these circumstances, and on this day of crisis, that the maximum effort of the Royal Flying Corps was concentrated on direct attacks against the advancing enemy. Ludendorff, in an order issued to the armies in July 1918, giving instructions for the improvement of protective measures against aircraft attack, referred to the losses of the German armies, as a result of air attacks during the offensive which began on the 21st of March, as 'extraordinarily high'.¹

Evidence has been quoted also from German regimental histories of the effect of some of the British low-flying attacks, but the reader should remember that these few quoted instances, although they are good samples, can convey no adequate idea of the intensity of the low-flying attacks, nor of the aggregate of material and moral damage which they inflicted. The targets offered by the German troops, batteries, and transport, on the move and without cover, were, from the point of view of the low-flying pilot, ideal. Nor could the enemy troops defend themselves against the low-flying attacks with the same confidence as when they were in well-prepared positions. Fire from men on the move, or temporarily halted, tended to be wild and was a different thing from concentrated fire from machine-guns sited in concrete-lined trenches and

¹ See also *My War Memories 1914-1918*, p. 601. 'All troops, especially 'mounted troops, had suffered heavily from bombing by hostile airmen.'

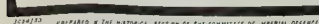
emplacements which the low-flying pilots had had to contend with in such attacks as were made before March 1918. And the human element must be considered. The fighting pilots, during the March retreat, knew how dire was the position of the armies for which they worked, and they knew, also, that theirs was the opportunity and power to take effective action to stem the German advance. They flew down, time and again, day after day, to within a few feet of the ground and performed many acts of gallantry which will for ever go unrecorded. Apart from the casualties which they inflicted and the undoubted effects which the attacks had on the morale of the German troops, the delaying action of the attacks was of importance. When an aeroplane dived on a marching column, the men invariably scattered into the fields, and they might not long be reformed again before they had to repeat the process to meet another attack. Damage to the transport of a column always meant an appreciable delay before the column could get on the move again.

A feature of the battle was the failure of the German Command to take advantage of the unique opportunities for intensive bombing offered by the retreating British columns. Civilian refugees, pushing household belongings on barrows and hand-carts, helped to block all roads. The evacuation of Péronne on the 23rd of March offered exceptional targets. Every road out of the town became blocked. Some infantry were able to make their way across fields, but the masses on the roads were such that 'had the enemy's aircraft been active, enormous damage 'could have been done', says a report on the operations by the staff of the VII Corps. 'Congestion behind our Third 'Army was extraordinary,' records a flying officer who took part in the battle. 'Peasants were fleeing westward on the 'Arras-Albert front carrying anything that could be saved '... they blocked the roads with slow-moving carts and 'barrows. Our relief battalions and rear service vehicles 'were struggling eastward to the aid of the troops in the 'line... the result was chaos. It is suggested that this was 'an air target open to the German force comparable to the 'Turkish debacle late in September. . . .'

The enemy airmen did some desultory bombing by night in the front area, and made many low-flying attacks by day, but there was no attempt comparable with the organized concentration of the Royal Flying Corps. Such distant bombing as the German air service did was strategical in object, but was neither heavy enough nor sustained enough to influence the progress of the operations. The main objectives for night bombing were the railway centres of Amiens and Longueau, Lillers in the First Army area, and the ports of Dunkirk, Calais, and Boulogne. The blowing up of an ammunition train at Longueau has already been referred to. There was a similar success at Lillers on the night of the 21st/22nd of March, when an ammunition train hit by a bomb blew up, destroyed the station buildings, and damaged the permanent way. The bombing of the Channel ports and their neighbourhood caused military and civilian casualties, but no appreciable military damage.

The change over by the British fighters from offensive patrols to low-flying had no adverse effect on the general air position for the reason that after the first days the Germans, like ourselves, to a great extent left the upper air. Such Royal Flying Corps offensive patrols as were sent out seldom found any enemy to attack. Had the German air service undertaken a vigorous offensive against the congested and vulnerable British lines of communication, it would have exerted a greater influence in the battle and would probably have forced the Royal Flying Corps fighting aircraft back into the upper air to fight the threat to the British back areas. By drawing off some or all of the British fighters and bombers in this way from low-flying attacks, the German air service would have struck a blow for the German infantry. This was a matter of policy, but it must also be pointed out that grave supply difficulties, which became more marked the farther the German infantry advanced, were encountered by the German air service. The enemy air casualties were heavy in the first days of the offensive and thereafter the air squadrons, with few exceptions, had to make do with what equipment remained. Many German air service prisoners

21st. MARCH, 1918.





told of nine or ten days being required for the satisfaction of demands for new aircraft to replace casualties, while many units received no replacements while the battle lasted. After the first two or three days, also, there was a break-down, more or less complete, in the liaison between the German air service units and the various army commands. The difficulty of liaison was complicated by the fact that many of the air units had to remain a long way behind the battle owing to the lack of suitable landing-grounds in the devastated area of the old Somme battlefield. For days the German air commanders received no orders and their operations were made on their own initiative. 'As they did not lack opponents, they had 'more than enough to do,' wrote General von Hoeppner, 'but their operations were not co-ordinated, either as to 'time or place, with the march of events on the ground. 'It therefore happened that the infantry were deprived, 'at the decisive times and places, of the help of the fighting 'pilots. The fault of the higher commands in not issuing 'timely orders to the fighting formations, appeared to 'the troops as a failure on the part of the air service.'¹

¹ *Deutschlands Krieg in der Luft*, p. 156.

CHAPTER VIII

THE BATTLES OF THE LYS

9th-29th of April, 1918

[Map, p. 404]

BEFORE the German offensive had died down on the Somme, air reports gave news of an ominous stirring in the La Bassée area. Ludendorff has revealed the importance of the attack at Arras on the 28th of March, the failure of which had led to a change of plans. The attack had had for object the capture of the heights east and north of Arras, and was to be followed next day by another attack to take the high ground about Lens. With these uplands in their possession the German armies would hold an advantage that must, it was calculated, prove decisive in any fighting in the plain of the Lys. But the waves of the assaulting German infantry on the 28th of March had been shattered by a rock-like defence and Ludendorff had thereupon cancelled the Lens attack. He decided now to strike as soon as possible in the plain of the Lys between La Bassée and Armentières, one of the sectors which had been considered earlier in the year for the main operation, and one in which the preparatory work had been done.

The air reports for the 31st of March and subsequent days showed the German change of plan in process of execution. On the 31st they told of a considerable northward movement of lorries, guns, and general transport, on and through Henin-Liétard, and on Carvin. That is to say, the divisions which had been assembled to exploit the expected Arras success were setting their faces towards La Bassée. Next day, the 1st of April, the air observers reported an extension of movements in the whole area east of La Bassée. One observer, between 6.40 and 8.40 a.m., counted fifty-five trains on the move along the lines feeding the La Bassée-Armentières front, many of them coming southwards from Lille. Other unusual train activity was in a westerly direction through and from Don, while barges, it was seen, had assembled on the canals, particularly about Don. Night bombers of the Fifty-Fourth Wing

also told of considerable train movements under cover of darkness. The air reports of the next few days, supplemented by air photographs, made it clear that the German concentration was of a formidable kind.

British General Head-quarters took full note of the new enemy concentration, but found it difficult to believe that Ludendorff had finally abandoned the Amiens offensive which had already taken him within reach of objectives of profound strategic importance. The separation of the British and French armies, the General Staff held, would continue to be the main enemy intention. Their expectation was that the end of the first phase of the Somme offensive would be followed by a converging attack on the Vimy ridge from the north-east and south-east, and they concluded therefore that the concentration on the La Bassée front portended a subsidiary attack to draw reserves from the Vimy ridge area. In fact, the battles of the Somme and of Vimy ridge had already been fought, and the British army had forced Ludendorff to acknowledge two strategical defeats. The Vimy ridge offensive had been given up after the disastrous attack at Arras on the 28th of March, and the 'extremely difficult' decision to abandon the Somme offensive for good had been made on the 4th of April.¹

¹ The General Head-quarters appreciation of the enemy's intentions, as set out in the Weekly Summary of Intelligence dated the 7th of April 1918, reads: 'The development of the battle since the 31st March shows no alteration in the enemy's plan. . . . As soon as the enemy's progress towards Amiens is held, he must be expected to strike again at the British army, the defeat of which is his ultimate object. This attack is likely to be a converging attack on the Vimy ridge from the north-east and south-east, and it seems likely that a subsidiary attack north of the La Bassée Canal may be made before the main attack, with the object of withdrawing reserves away from the main battle-front. As regards the date of the attack, it has been already suggested that it will not be delivered until the operations in the Amiens area have developed . . .'

Ludendorff says: 'On the 4th April the 2nd Army and the right Wing of the 18th attacked at Albert and south of the Somme towards Amiens. These actions were indecisive. It was an established fact that the enemy's resistance was beyond our strength. We must not get drawn into a battle of exhaustion. This would accord neither with the strategical nor the tactical situation. In agreement with the commanders concerned, G.H.Q. had to take the extremely difficult decision to abandon the attack on

Ludendorff knew that the British line north of the La Bassée Canal had been greatly weakened by the withdrawal of divisions to stem the advance on the Somme. Of a total of fifty-eight British infantry divisions in France, forty-six had been engaged in the Somme battles, and in the thinning-out process Flanders had suffered most. There was nothing in the air reports and air photographs up to the 9th of April to support the view, held by General Headquarters, that a converging attack on the Vimy ridge was likely. On the contrary the air information showed that the German troops opposite Arras were being drawn upon to supply reinforcements for the north and should have left little doubt that the immediate enemy concentration was northwards from the La Bassée Canal.

The threatened British line was the left of the First Army and the right of the Second. The centre part of the sector between La Bassée and Armentières was held by Portuguese troops. The relief of the Portuguese had been decided upon before the German Somme offensive opened, but that offensive had delayed its execution. On the 5th of April, however, it was deemed advisable to proceed, and, on the 6th, the 1st Portuguese Division, less one infantry brigade, was withdrawn from the line. The remaining Portuguese Division—the 2nd—which incorporated the brigade left behind by the 1st Division, came under the orders of the XI Corps (First Army) which took full command of the front from the La Bassée Canal to the junction with the XV Corps (also First Army) near Picantin. Tactical considerations made it advisable that the XV Corps should be transferred from the First to the Second Army, but as this reorganization would leave the Portuguese on the Army boundary, it had to be deferred.¹

Meanwhile the abnormally fine weather had led to a rapid drying of the ground, and made possible an attack

‘Amiens for good. . . . Strategically we had not achieved what the events of the 23rd, 24th and 25th had encouraged us to hope for. That we had also failed to take Amiens . . . was specially disappointing.’ (*My War Memories*, p. 600.)

¹ The XV Corps was transferred to the Second Army on the 12th of April.

much earlier than had been anticipated. This was a matter for anxiety. The 2nd Portuguese Division held a front of nearly 10,000 yards, more than any troops could, in the circumstances, be expected to maintain against Ludendorff's attacks, and, on the 8th of April, it was decided that the 50th Division, newly arrived from the Somme battles, and a brigade of the 55th Division, should take the place of the Portuguese troops. The relief was timed to begin on the night of the 9th/10th of April, but it was forestalled by the opening of the German offensive on the morning of the 9th.¹

That the relief might come too late was indicated from the air. From photographs taken in the afternoon of the 6th of April it was apparent that the German offensive preparations north of Aubers, opposite the Portuguese left, were well advanced.² Throughout the morning of the 7th air observers reported the main roads immediately opposite the Portuguese to be full of moving transport, and ground observers told of men carrying ammunition into the German support lines. The impression conveyed by the combined air and ground reports was that the tactical concentration was nearing completion. On some of the enemy transport, notably mechanical vehicles on the Herlies-Aubers road, artillery fire was brought to bear through zone call from the air, and several lorries were wrecked. While these daylight movements were proceeding in the forward area in the morning, railway traffic on the lines to the eastward was normal, but in the afternoon and evening of the 7th, air reconnaissances revealed a great increase of train movements. There was considerable southward traffic from Lille towards Don and Provin. Full trains were running north from Carvin to Provin, and from Courrières, east of Lens, towards Carvin, with a line of empty trains going in the opposite direction, indicative of a transference of troops northwards from the areas east or

¹ Actually the 50th Division was moved from the XI to the XV Corps area in the afternoon of the 8th, being replaced in the XI Corps by the 51st Division.

² The heavy artillery of the XV and XI Corps, as a result of the air reports, bombarded the area in the evening and caused many explosions.

south-east of Lens. This intensive railway activity attracted attention not only for its strength, but also for the time at which it was taking place. Train concentrations were seldom reported after the early morning when they represented an overflow of movements which had taken place under cover of night. The daylight activity in the forward area on the 7th, and the train movements in the back areas, implied that the time factor was reckoned by the German Command more important than risks of disclosure.¹ Other notable signs on the 7th of April were the activity of German aircraft over the La Bassée front, and an absence of enemy artillery fire.² If any doubt remained, it must have been removed by an intense, but restricted, bombardment with shells—chiefly mustard gas—which began on the night of the 7th/8th and seemed to aim at the isolation of certain areas on the flanks of the proposed attack. In the south, the area thus drenched stretched from Cité St. Emile to the La Bassée Canal, and, in the north, covered Armentières and its neighbourhood.

The main German attack was made by the Sixth Army, which, on the 9th of April, had nine divisions in line, five in close support, and three in reserve.³ The German Fourth Army, which had received a reinforcement of four divisions by the 3rd of April, was to attack in the north,

¹ 'The attack was remarkably carefully planned by the 6th Army. . . . In spite of having but few men available for work everything had progressed so well that the attack could be arranged to begin on the 9th April. I was glad of this. The sooner it could take place the more likely was it to surprise the Portuguese in the plain of the Lys.' (Ludendorff, *My War Memories*, p. 606.)

² A British artillery summary of the operation says: 'Two days before the attack commenced it became almost certain that it was imminent, and from an artillery point of view the clearest indication of this was that the enemy artillery refused to be drawn. If, in fact, it is desired to ascertain whether an assembly of troops is in progress, the information may be obtained almost for certain by shelling his communications and billets, railway stations, villages etc. and noting the reply thereto. The weaker the reply the more certain are impending operations. On the 7th of April no reply could be extracted from the enemy either by day or night, and we therefore felt sure the attack was close at hand.'

³ See *Der Grosse Krieg, 1914/1918, dritter Teil*, by Generalleutnant Max Schwarte, p. 436.

twenty-four hours after the opening of the main offensive, to support the Sixth Army and to exploit its success.

On the British side, between the La Bassée Canal and Armentières, on the morning of the 9th, the line was held by the 55th Division and by the 2nd Portuguese Division of the XI Corps, with the 51st Division in reserve, and by the 40th and 34th Divisions of the XV Corps with the 50th Division in reserve. Northwards of the XV Corps, beyond the Lys and covering the Wytschaete ridge, was the IX Corps (Second Army) which had the 25th, 19th, and 9th Divisions in line. Every one of these British divisions, except the 55th, had been severely tried in the Somme battles.

The Royal Air Force Command working with the First Army was the I Brigade (Brigadier-General D. le G. Pitcher). The Army Wing (Tenth) of this Brigade had been drawn upon to reinforce the Third and Fifth Armies for the Somme battles, and, by the 31st of March, had been reduced from five single-seater fighter squadrons to three, and to one D.H.4 Squadron. The Brigade had also lost a Bristol Fighter Squadron (No. 22), transferred to the III Brigade on the 23rd of March.

On the 1st of April, however, the Wing was reinforced by No. 210 Squadron from Dunkirk and by No. 19 Squadron from the II Brigade, and, next day, was further reinforced by No. 208 Squadron from Dunkirk. On the morning of the 9th of April, therefore, the Tenth (Army) Wing included seven squadrons as follows:

Sopwith Camel: Nos. 4 (Australian Flying Corps), 203, 208, and 210.

S.E.5a: No. 40.

Sopwith Dolphin: No. 19.

D.H.4: No. 18.

When, on the 8th of April, it had become clear that the attack was about to begin, Major-General J. M. Salmond had obtained sanction to reinforce the First Army by bringing back No. 22 (Bristol Fighter) Squadron from the Third Army and by transferring No. 41 (S.E.5a) Squadron from General Head-quarters reserve. The moves were

ordered to take place on the 9th, but the squadron aeroplanes were not flown to their new aerodromes in the First Army area until the 10th (No. 22) and 11th (No. 41). In addition, two fighter squadrons with the III Brigade had been ear-marked for transfer once the attack began. These were Nos. 46 ('Camel') and 64 (S.E.5a) and they moved to the I Brigade on the 11th of April.

The Corps squadrons of the First (Corps) Wing working with the First Army north of the La Bassée Canal on the morning of the 9th were:

No. 42 (R.E.8)	.	.	.	.	XI Corps.
No. 4 (R.E.8)	.	.	.	.	XV Corps.

and immediately south of the La Bassée Canal:

No. 2 (Armstrong-Whitworth-Beardmore) I Corps.

The IX Brigade squadrons were also disposed at aerodromes whence they could support the threatened front. At Auchel, in the First Army area, were the night-bombing squadrons of the Fifty-fourth (Night) Wing, Nos. 58 and 83, together with a Special Duty Flight. At aerodromes west of Lens, to which they had moved at the end of March, were the six squadrons making up the Ninth (Day) Wing (Nos. 32, 73, and 79; 62; and 25 and 27). West of Arras were the remaining head-quarters squadrons. These had been grouped into the Fifty-first Wing, the head-quarters of which had left Italy on the 10th of March and had come into the IX Brigade on the 4th of April. The Wing received No. 80 Squadron transferred from the Ninth Wing, No. 43 from the III Brigade, and No. 2 (Australian Flying Corps) Squadron from the V Brigade.¹

In the first week of April the enemy air activity on the front north of the La Bassée Canal was not great. On the 1st of April the squadrons of the Tenth (Army) Wing with the First Army, previously under orders to stand by daily from dawn to make low-bombing attacks as required on the fronts of the First, Third, or Fifth Armies, had been instructed that, on and from the 2nd of April, they were to hold themselves ready for similar duties on the First Army

¹ The Brigade strengths, in squadrons, of the Royal Air Force in France on the 9th of April is given as Appendix XIX.

front only. That is to say, it was indicated that the tension on the Third and Fifth Army fronts was judged to be ended, and that the First Army might be involved in a new attack any day after the 2nd of April. The day-bomber squadron—No. 18—of this Wing had the rail-head at Douai for its allotted objective up to the 7th, but could do little because of unfavourable weather. On the 7th the squadron was given the target of Haubourdin station on which fourteen 112-lb. and twenty-four 25-lb. bombs were dropped in the afternoon. The same target had been attacked in the morning by No. 206 (D.H.9) Squadron of the II Brigade with five 112-lb. and eighty-seven 25-lb. bombs. This squadron had bombed in the First Army area on the 2nd of April when two raids had been made on the station at Don and a total of one hundred and thirty-eight 25-lb. bombs dropped. The 'Camels' of No. 4 (Australian Flying Corps) Squadron, with S.E.5a's of No. 40 Squadron as escort, made low-bombing and machine-gun attacks between Lens and the Scarpe on the first three days of April, but on the 7th their activities were directed north of the La Bassée Canal and they attacked targets on the La Bassée-Fournes road. No. 58 (night-bombing) Squadron attacked the railway at Douai and Dechy on four nights during the first week in April with a total of 480 bombs. It will be noticed that no special attempts were made, during the first week in April, to interrupt, by bombing attacks, the German concentrations reported by the air observers on the La Bassée-Armentières front. This was because General Head-quarters believed, as we have seen, that the La Bassée attack would be of a subsidiary kind and that the main blow would fall in the area of the Vimy ridge. That is why the main bombing was directed, in this period, against the railway centres opposite the ridge.

Although no special offensive operations were initiated by the Royal Air Force up to the 7th of April, the Corps squadrons and the balloon sections worked incessantly, assisting the heavy artillery to register main roads and other lines of approach, and directing destructive fire on known enemy batteries. The tactical reconnaissance

reports and air photography of the Corps squadrons were valuable, as has been indicated, in elucidating the enemy's intentions.

The Battle Opens

9 April On the morning of the 9th of April there was a thick fog which did not clear until 2 p.m. About 4.5 a.m. a heavy bombardment began along the front from the La Bassée Canal to Fleurbaix, south-west of Armentières. The fire was chiefly directed against battery positions, head-quarters and road junctions, but there was also a considerable gas-shelling of back areas. At 6.30 a.m. the bombardment diminished, but it flared up again at 8 a.m. Small parties of German infantry had begun to push forward from 7.30 a.m., but the main attack, extending from the La Bassée Canal to Bois Grenier, was not launched until about 8.45 a.m.

In the centre, the masses of enemy troops rapidly overwhelmed the thin line of the Portuguese Division. Not long after the attack began the Division had ceased to exist as a military force and a wide breach had been made through which the German divisions thrust forward with remarkable rapidity. Soon after the opening of the bombardment, the 50th and 51st Divisions, both of which had been battered in the March offensive, had been ordered to take up a prepared line running from Le Touret, through Huit Maisons, to a point east of Laventie, but the retreating Portuguese and derelict transport cumbered the heavily shelled roads, and the movement of the divisions was delayed. Had it not been for a stubborn defensive effort by the 1st King Edward's Horse and by the 11th Cyclist Battalion, sent forward to cover the deployment of the two divisions, the situation might have got beyond the possibility of recovery. As it was, the prepared line of resistance could only be partially manned and the 50th and 51st Divisions became involved in a fluctuating and confused battle of movement against overwhelming numbers. The retreat of the Portuguese had uncovered the flank of the 40th Division on its left, and the enemy, exploiting the opening this gave him,

struck north, between Laventie and east of Fleurbaix, to the Lys at Bac St. Maur, and, by 2.20 p.m., had succeeded in passing men across the river. He then proceeded to enlarge the bridge-head and, by the evening, had reached Croix du Bac. On the right of the British line, the attacks on the 55th Division met with little success; at Givenchy the division held its ground, but its left bent back to ensure continuity of the line. The resistance of this division, by which the way to the important centre of Béthune was kept barred, was a vital element in the first stage of the battle.

The fog prevented flying until 2 p.m.; the enemy bombardment had cut most of the communications over the whole area, runners and dispatch riders could do little, and few of those responsible for directing the defence could get much idea of what was happening during the morning. No. 208 Squadron, who were on an aerodrome at la Gorgue about three and a half miles behind the original front, could not get their aeroplanes away. It was impossible to see across the landing-ground, which was under intermittent shell-fire all the morning. Towards midday, when all outside communications had been cut off, and the enemy was (erroneously) reported to be at the gates of la Gorgue, the squadron commander gave the order for the eighteen 'Camel' aeroplanes, which had been collected in the centre of the aerodrome, to be burned. The squadron personnel, with their transport and stores, moved back through the fog to an aerodrome at Serny where the squadron was fully re-equipped within forty-eight hours.

Although the fog lifted at 2 p.m. the visibility continued poor throughout the remainder of this tangled day with clouds down to 1,000 feet. The first contact-patrol aeroplane—of No. 4 Squadron—was over the front a few minutes after 2 p.m. and fifty minutes later the observer dropped a report at XV Corps head-quarters which showed the German infantry along, or approaching, the river Lys east of Estaires, while south of that town they were fighting east of the Lawe river. Other contact reports during the afternoon revealed that the German advance was slowing down, but there were indications that the enemy

9 April intended further to exploit, in a northerly direction, the break-through which had already taken him across the Lys about Bac St. Maur. South of Estaires, the general position of the German line opposite the XI Corps was reported by a contact observer (Lieutenant R. P. Allday of No. 42 Squadron) as running, at 6 p.m., from just east of Estaires to the Fosse bridgehead, and thence southwards to Vieille Chapelle where it bent south-westwards and followed the direction of the Lawe river towards Locon, short of which it bent south-eastwards to Le Touret and so on to Festubert and Givenchy. This report, made by direct observation from a low height without help from flares or other special devices, gave, as was confirmed by later reports from the ground, an approximately accurate survey of the limit of the German advance on the 9th of April.

Despite the bad weather conditions and the fact that the German advance compelled many squadrons to pack up hurriedly and go on the move,¹ many low-flying attacks were made against ground targets by single-seater fighters. Twenty 'Camels' of No. 203 Squadron, fifteen of 210, five of No. 4 (Australian) Squadron, and seven S.E.5a's of No. 40 Squadron, at intervals from about 2.30 p.m., attacked with bombs and machine-gun fire bodies of advancing infantry, particularly on the roads in the neighbourhood of Bac St. Maur, Estaires, and Festubert.² These low-flying fighters came into conflict with German two-seater contact-patrol aeroplanes, five of which were destroyed, two of them in flames: one British single-seater fighter failed to return. Apart from this limited amount of low-flying over the battle-front, there was no other air activity on the 9th of April.

On the 10th the battle spread to involve parts of the

¹ Nos. 18, 203, and 210 Squadrons evacuated Treizennes to make room for Nos. 4 and 42 Squadrons from Chocques. No. 18 went to Serny and Nos. 203 and 210 to Liéttrés. No. 208 also went to Serny from la Gorgue.

² The history of the 202nd Reserve Regiment, which attacked in the neighbourhood of Festubert, says: 'The battalions all suffered severely during their approach march from the British low-flying aircraft which attacked them savagely with machine-gun fire and bombs. The German pilots were unable to do much in view of the British air supremacy.' (*R.I.R.* 202, p. 136.)

British Second Army and the German Fourth Army. At 5.15 a.m., after bombardment, an attack was launched north of Armentières. By noon Ploegsteert village and most of Messines had gone. The 34th Division, in danger of being cut off in Armentières, began to move back, under orders, from 1 p.m. Meanwhile there had been no respite on the original battle-front where the attacks had been renewed at dawn. The pressure was greatest east of Estaires, the enemy spreading out fanwise from the bridgehead he had gained on the previous evening: by 5 p.m. Steenwerck had fallen. The position was one of extreme gravity, but, on the flanks of the attack, the enemy was still held. At Givenchy and Festubert, the 55th Division stood firm, while, in the north, the 9th Division brought the enemy to a standstill. The stand of these two pillars at either end of the battle-field was of vital consequence. It confined the German advance to an uncomfortably narrow front and also made possible readjustments of the British line.

The weather was again bad for flying on the 10th. Clouds were at 1,000 feet most of the day, and in the early morning, and again after 2 p.m., there was, in addition, a ground mist. In the battle area every attempt was made to report the progress of the advance, and the oncoming German troops were attacked from the air. The risks entailed were high and the casualties, due to fire from the ground, were appreciable: on the First Army front two Australian pilots and a Corps squadron pilot and observer were missing, and three pilots and five observers were wounded; on the Second Army front one fighter pilot was reported missing and two were wounded. Of the German low-flying aeroplanes, seven were destroyed in air combat, two of them in flames—and two others were shot down from the ground within the British lines.

The contact-patrol observers were able, by direct observation from a height of 200–400 feet, to report the main fluctuations of the battle-front, particularly in the First Army area. The fighter squadrons of the I Brigade and, to a lesser extent of the II Brigade¹ (Second Army),

¹ The fighter squadrons of the II Brigade on the 10th of April were 54

10-11 were used exclusively for low-flying attacks. Pilots of the
April I Brigade (Nos. 203, 4 Australian, 210, 19, and 40 Squadrons) dropped three hundred 25-lb. bombs and fired 30,000 rounds of ammunition against troops and transport. In addition No. 18 (D.H.4) Squadron made an attack, from 400-600 feet, on targets along the Estaires-La Bassée, and Estaires-Merville roads, dropping eleven 112-lb. and thirty-six 25-lb. bombs. The low-flying attacks on the Second Army front were made chiefly by No. 1 (S.E.5a) Squadron which dropped fifty-six 25-lb. bombs, and fired some thousands of rounds of machine-gun ammunition. Along the whole front good targets for low-bombing were difficult to find because the enemy movements were mainly confined to small parties. There was, however, one instance in the morning when 2,000 infantry were found massed in a park and were attacked with machine-gun fire by a pilot of No. 1 Squadron.

On the 11th of April the battle was fiercely renewed along the whole front. Although the flanks again stood firm, the enemy, at heavy cost, made considerable progress, and, as the bulge in the British line increased, the defending troops became more and more strung out. Gaps were left through which the German infantry pushed forward: by the evening German troops were in Merville, Nieppe had gone, and we had finally lost our hold on Messines.

Up to midday, mist and rain again hampered flying, but in the afternoon the weather cleared and there followed great air activity on both sides. Contact patrol, close reconnaissance, and photography were the main pre-occupations of the Corps squadrons, and the air observers had little difficulty in following the movements of the line. The fighter squadrons were once more concentrated on low-bombing attacks. On the First Army front some four hundred 25-lb. bombs were dropped and 50,000 rounds

(‘Camel’), 1 (S.E.5a), and 29 (Nieuport); also 20 (Bristol Fighter). There were two D.H.9 Squadrons—Nos. 98 and 206. On the 11th of April No. 29 moved to the Dunkirk Command and their place was taken in the Second Army area by No. 74 (S.E.5a) Squadron, a new squadron which had arrived from England on the 30th of March and was quickly to become famous for its fighting prowess.

fired. On the Second Army front more than a hundred ¹¹⁻¹² 25-lb. bombs were dropped, some of them on bridges ^{April} over the Lys, three of which were damaged by direct hits. No. 18 Squadron (First Army) attacked Fleurbaix, Laventie, Neuve Chapelle, and targets on the La Bassée-Estaires road. Nos. 98¹ and 206 (D.H.9) Squadrons (Second Army) bombed Wervicq (twenty-four 112-lb. bombs) and Armentières (twenty-six 112-lb. bombs).

The head-quarters IX Brigade, with the improved weather in the evening, took part, for the first time, in the Lys battle. No. 25 (D.H.4) Squadron attacked the railway junction at Haubourdin, and No. 27 Squadron bombed the station at Don. In addition to combats between low-flying aircraft on the battle-front there were many encounters in the afternoon and evening between fighting formations. Up to 4 p.m. the main German air offensive activity was south of La Bassée, but after that time was centred over the battle area.

During the night of the 11th/12th bombing was resumed. No. 2 (Armstrong-Whitworth) Squadron dropped ninety-six 25-lb. bombs on Lestrem, Estaires, la Gorgue, and Laventie. The IX Brigade squadrons, however, were ordered to attack objectives in the Somme area. No. 102 dropped one hundred and fifty-five 25-lb. bombs on Bapaume and No. 101 attacked various billeting villages with two 112-lb. and one hundred and eighty-four 25-lb. bombs. The other night-bombing squadrons of the brigade (Nos. 58 and 83 of the Fifty-fourth Wing) were fog-bound on their aerodrome at Auchel (Lozinghem).

The 12th of April was a critical day. British reinforcing divisions were on their way, but until they got into position the fighting would have to be borne by the tired and mixed battalions which, greatly outnumbered, had withstood the German attacks from the opening of the battle. Could the thin line hold together until the reinforcements arrived? Merville had fallen and it must be expected that the enemy would make a determined thrust towards Hazebrouck. Every mile of ground

¹ No. 98 (D.H.9) Squadron arrived from England on the 1st of April.

12 April was now vital. On the morning of the 12th Sir Douglas Haig issued to the armies his often-quoted order exhorting the troops to hold every position to the last man.¹

At Merville and immediately to the north, only the remnants of the 50th Division and a composite battalion stood between the enemy and Hazebrouck. The 5th Division, fresh from Italy, was being rushed to the sector, but its deployment could not be finished before the evening. At 7.30 a.m., therefore, the First Army Commander emphasized the imperative need to close the gap at Merville and to maintain the position to give time for the 5th Division to deploy. Special instructions were given for the employment of the aircraft of the I Brigade. They were to concentrate their attacks on enemy troops advancing on Merville from Neuf Berquin or from Estaires. The Brigade Commander was, at the same time, requested by the First Army Commander to obtain the help of the IX Brigade in this task. The arrangements made to comply with these requests were prompt and comprehensive. The First Army Commander was informed at 8.30 a.m. that the squadrons of the I Brigade were concentrating on the bombing of Merville, Neuf Berquin, Estaires, and the neighbouring roads, and that the squadrons of the IX Brigade would co-operate.²

¹ 'To all ranks of the British Army in France and Flanders. Three weeks ago to-day the enemy began his terrific attacks against us on a fifty-mile front. His objects are to separate us from the French, to take the Channel Ports, and destroy the British Army. In spite of throwing already 106 divisions into the battle, and enduring the most reckless sacrifice of human life, he has, as yet, made little progress towards his goals. We owe this to the determined fighting and self-sacrifice of our troops. Words fail me to express the admiration which I feel for the splendid resistance offered by all ranks of our Army under the most trying circumstances. Many amongst us now are tired. To those I would say that victory will belong to the side which holds out the longest. The French Army is moving rapidly and in great force to our support. There is no other course open to us but to fight it out. Every position must be held to the last man; there must be no retirement. With our backs to the wall, and believing in the justice of our cause, each one of us must fight on to the end. The safety of our homes and the freedom of mankind depend alike upon the conduct of each one of us at this critical moment.'

² The work of the Army Wing Squadrons of the I Brigade had to be

A little before dawn on the 12th the German infantry *12 April* had broken through the centre of the 51st Division south of Merville, and they moved on to the La Bassée Canal. The 3rd Division came up on the right of the 51st and the 61st Division on its left, and, by the end of a day of desperate fighting, the front had been steadied between Locon and the Clarence river. At Merville the enemy gained some ground, and to the north, fresh German divisions which were thrown into the battle drove in the front and opened a gap south-west of Bailleul. The gap was rapidly exploited by parties of German infantry which pushed through to Outtersteene and Merris, and Hazebrouck was seriously threatened. The situation throughout the afternoon and evening was one of extreme gravity. The enemy troops, flushed with the prospect of a decisive success, pressed forward with determination, but their advance towards Hazebrouck was checked by a brigade of the 33rd Division which, with a mixed assortment of other troops, closed the gap.

Throughout the whole of this vital day of the battle, the advancing German divisions were subjected to relentless attacks by the British air squadrons. The day was fine and the visibility good, and every squadron was used unsparingly from dawn to dark. The result was that more hours were flown, more bombs dropped, and more photographs taken than on any day since the war began.¹ The

entirely rearranged. Operation orders issued on the evening of the 11th had detailed Flights of fighters to leave at intervals from dawn to 7 p.m. to bomb targets on the La Bassée-Estaires road and attack, with machine-gun, general targets between La Bassée and the Lys. The orders allowed for 22 Flight patrols of this kind. In addition, there were to be fourteen offensive patrols by Flights, photographic and other reconnaissances, line patrols, and bombing by No. 18 (D.H.4) Squadron of Don, Fournes, Fleurbaix, Laventie, and Richebourg-St. Vaast. No. 18 Squadron was switched over to the bombing of Estaires. The operation orders for the IX Brigade had detailed strategic reconnaissances as far east as Mons and Valenciennes and continuous bombing of the railway junctions south-east of Lille. Half the strength of the Brigade was to be kept standing by for high patrols as ordered by Royal Air Force head-quarters, presumably so that they could be put into the battle as and when they were most needed.

¹ Hours flown, by all Royal Air Force squadrons on the Western front, 3,240; bombs dropped, 2,548 (four 250-lb., three hundred and ninety-two

12 April balloon observers, so often hampered by unfavourable weather conditions, had a clear panorama. In the area of the German advance the balloons had been withdrawn, but those working with the First Army immediately south of the La Bassée Canal had observation from the flank over the German lines of approach to the battle. The balloon observers gave information about many targets of moving troops and transport, and about active batteries, and helped to direct artillery fire on them. Twice in the afternoon, when a congestion of troops and transport was seen at the junction of the Lorgies and the La Bassée-Estaires roads, a balloon observer south of the canal effectively directed a 12-inch howitzer on the position.

The contact-patrol observers of the Corps squadrons, by direct observation from low heights, had no difficulty in following and reporting the positions of the German and British infantry along the fronts of the First and Second Armies. The progress of the battle, hour by hour, was made clear as had never been made clear before. Close reconnaissance of the area behind the battle-front was continuous, and the movements of the oncoming Germans were plotted with systematic precision. The air reports left no doubt that the main intention of the enemy was to push westwards and north-westwards from Merville and Estaires towards Hazebrouck. When enemy troops were seen massed within artillery range, wireless calls were sent

112-lb., and two thousand one hundred and fifty-two 25-lb.); photographs taken, 3,358; rounds fired 114,904. Figures of flying hours are available for a few individual squadrons. No. 201 ('Camel') Squadron, with 16 effective pilots, flew 89 hours; No. 206 (D.H.9 bombers), 19 pilots, 76 hours; No. 18 (D.H.4 bombers), 13 pilots, 44 hours; No. 22 (Bristol Fighter), 13 pilots, 42½ hours; No. 4 (R.E.8), 16 pilots, 63 hours; No. 209 ('Camel'), V Brigade in Somme area, 16 pilots, 76 hours. Composite figures show that the I Brigade, with 287 pilots, flew 798 hours; the II, with 170 pilots, 351 hours; the III, with 200 pilots, 623 hours; the V, with 209 pilots, 675 hours; and the IX with (approximately) 200 pilots, 538 hours. Many individual pilots did between 6 and 7 hours flying. All figures quoted are as made up in the field and are from 4 p.m. on the 11th of April to 4 p.m. on the 12th, but it may be accepted that figures for the full day of the 12th would not be very different. The squadrons of the II Brigade were partly disorganized through enforced moves due to the German advance.

out to the British guns and many of them were answered. *12 April*
Along the whole front, eighty-nine such calls for fire on important fleeting targets were made, the majority of them from over the Lys battle-field.

The main weight of the Royal Air Force offensive was directed to stemming the advance towards Hazebrouck. In the early morning the low-flying and bombing attacks were widespread, but from about 9 a.m. they were concentrated in the Merville area. Formations, numbering from four to fifteen aeroplanes each, of fighters from the I Brigade squadrons went out at brief intervals from 6 a.m. to 7 p.m. Seventeen such formations from this brigade—a total of one hundred and thirty-seven aeroplanes—appeared low over the battle-field and relentlessly attacked and pursued the German infantry and transport. The Corps squadrons of the I Brigade also dropped bombs while engaged on their tasks of reconnaissance. In all, throughout the day, the squadrons of this brigade dropped seven hundred and fifty 25-lb. bombs and fired 60,000 rounds of machine-gun ammunition at ground targets.¹ In addition, the D.H.4 day-bomber squadron—No. 18—of the brigade concentrated its attacks, with bomb and machine-gun, in the Merville area, and bombed Merville and Estaires six times during the day.

The II Brigade, working with the Second Army to the north, also devoted the major part of its offensive activities to countering the threat to Hazebrouck. No. 1 (S.E.5a) Squadron, in particular, did good work, and made repeated low-flying attacks on targets at Merville, Estaires, Neuf Berquin and Steenwerck. The pilots of this squadron dropped one hundred and twenty-five 25-lb. bombs and fired over 5,000 rounds of ammunition. One of their attacks was made in the evening on transport and massed infantry, 3,000 strong, west of Steenwerck.

The two D.H.9 day-bomber squadrons, Nos. 98 and 206, of the II Brigade, attacked the German lines of communications north-east of Armentières (Comines, Quesnoy, Frélinguien: twenty-one 112-lb. bombs) and south-west

¹ Pilots of No. 203 Squadron alone dropped one hundred and ninety-six 25-lb. bombs and fired 23,000 rounds of ammunition.

12 April of Lille (Haubourdin: thirty 112-lb. bombs) in the morning, but in the afternoon they, too, were diverted to the critical Merville area. Soon after 3 p.m. No. 98 Squadron attacked Neuf Berquin (three times), Estaires, and Steenwerck. In all these places the roads were congested with troops and transport and when the bombs had been released (a total of fifty-five 112-lb. from about 2,500 feet) the pilots and observers attacked the enemy forces with their machine-guns. No. 206 Squadron bombed targets between Armentières and Estaires at 6.30 p.m., dropping twenty-one 112-lb. bombs. Altogether the squadrons with the Second Army dropped one hundred and fifty-seven 112-lb. and two hundred and seventy-nine 25-lb. bombs, and fired 13,300 rounds of ammunition.

Air fighting was continuous. German low-flying aircraft were less active than on the first three days of the battle, but in spite of the great concentration of British aeroplanes, the enemy pilots and observers showed determination in their efforts to co-operate with their attacking divisions, while high formations got through from time to time to reconnoitre the lines of communications behind the First and Second Armies. The British low-flying pilots pursued and attacked many German aeroplanes encountered during their flights. Above them, from 3,000 feet upwards, flew offensive formations of fighters from both the I and II Brigades. There were also, at the heights at which these fighters flew, and in the upper air, strong offensive formations of the IX Brigade. Each offensive formation was usually made up of two Flights—a total of about ten aeroplanes—but over the battle-field the fighting formations often supported one another. German formations of fifteen or twenty Pfalz and Albatros Scouts were often met with, particularly near Merville. One ‘Camel’ pilot, Captain H. W. Woollett of No. 43 Squadron, while flying as leader of his patrol, destroyed six German aeroplanes during the day, three in the morning and three in the evening, all of them in the neighbourhood of Estaires.

The enemy made many attempts on the battle-front to supplement his aeroplane artillery and tactical observation

by using balloons.¹ Some of these were pushed well forward as the German infantry advanced, and if an opportunity came to let them up, it was promptly taken. Several attacks on the balloons were made, but they were hauled down at the least sign of danger. At 1.5 p.m. a special patrol of seven 'Camels' of No. 210 Squadron, with an escort of five S.E.5a's of No. 40 Squadron, was sent out to attack balloons in the forward area. The 'Camels' crossed the lines at 6,000 feet, with their escort 1,000 feet higher. Five balloons were found at about 2,000 feet and attacked in turn, each by three pilots. All the German observers took to their parachutes, and one of them was killed. One balloon burst into flames, but the others, bullet-riddled, were hauled to the ground. Altogether, during the day on the whole front, six German balloons were destroyed.

The two day-bomber squadrons, Nos. 25 and 27, of the Ninth Wing made strategic photographic and visual reconnaissances, and also twice bombed a station at Lille (twenty-three 112-lb. and fifty 25-lb. bombs) and the station at Hellemmes, east of Lille (twenty-six 112-lb. and fifty-two 25-lb. bombs). The distant reconnaissances reported no abnormal activity along the German lines of communication.

During the night of the 12th/13th of April the Fifty-fourth Wing bombing squadrons attacked targets in the battle area. No. 83 (F.E.2b) Squadron bombed Estaires, and the Estaires-La Bassée road, along which much traffic was reported, dropping a total of twenty-eight 112-lb. and two hundred and fourteen 25-lb. bombs. The attacks of No. 58 (F.E.2b) Squadron were concentrated on the station at Don, on which forty-one 112-lb. and two hundred and ninety-three 25-lb. bombs were dropped. Douai was attacked by a Handley Page of No. 214 Squadron by the light of flares which illuminated the railway junction and revealed great train activity. Night bombing by No. 102 Squadron was directed against Bapaume, and by No. 101 Squadron against billeting villages opposite the Fourth Army front in the Somme area. The bombing

¹ The use of balloons to give tactical information had been greatly expanded. See Hoeppner, *Deutschlands Krieg in der Luft*, p. 124.

13-18 by the latter squadron was spread over nine hours, many
April of the pilots making four journeys.¹

After the 12th of April the impetus of the German Sixth Army began to slacken, but the German Fourth Army continued to thrust forward. The weather for some days was wet and misty, and flying was greatly curtailed. On the 15th of April Bailleul fell into the enemy's hands. Two days later there were determined, but abortive attempts to take Kemmel Hill, while a strong attack on the right of the Belgian Army, which had for object the capture of Bixschoote and the advancement of the German line beyond the Yser-Ypres Canal, also met with failure. Subsidiary attacks were made at Meteren and Merris. Up to 11 a.m. on the 17th, while the German attacks were being made, the weather was fairly clear, and the Corps squadron pilots and observers made many successful low reconnaissances and contact patrols to report the progress of the battle, and a great number of targets were notified, by wireless call, to the British batteries. Low-flying attacks were maintained throughout the day, although visibility was poor again after midday. The two D.H.9 Squadrons of the II Brigade—Nos. 98 and 206—twice attacked Bailleul, and targets on the road to Meteren. The attacks by the fighter squadrons of the brigade on ground targets were made with one hundred and six 25-lb. bombs and many thousands of rounds of ammunition. Squadrons of the I Brigade on the First Army front dropped twenty 112-lb. and three hundred and eighty-three 25-lb. bombs from low heights. Enemy air activity was slight, but two hostile aeroplanes were destroyed.

Next day, the 18th of April, a thrust was made in the southern part of the battle-field towards Béthune, the attack extending from Givenchy to Merville. This attack, which began at dawn and was made with reckless determination, was repulsed at most points with exceptionally heavy losses to the enemy. At Givenchy and Festubert the German infantry made ground, but lost most of their gains to counter-attacks. The fighting took place in rain and snow-storms, and flying was restricted, but pilots of

¹ Sixteen pilots of the squadron flew a total of 58 hours.

the I Brigade dropped one hundred and seventy 25-lb. ¹⁸⁻²¹ bombs and fired 17,500 rounds of ammunition against ^{April} ground targets. Successful low reconnaissance and artillery and contact patrols were made by pilots and observers of the Corps squadrons. Few German aircraft were seen over the front; one which attacked a Corps aeroplane of No. 4 Squadron was shot down.

During the night of the 18th/19th of April, No. 83 Squadron attacked Armentières and No. 58 Squadron bombed Warneton, and transport on roads near Quesnoy. Nos. 5 and 16 Squadrons made night reconnaissances of the lines of communication behind the battle areas and dropped bombs on Neuf Berquin. Outside the battle area, No. 102 Squadron attacked Bapaume and roads in the neighbourhood, and No. 101 Squadron attacked Chaulnes railway junction east of Villers-Bretonneux and billeting villages in the Somme area.

After the failure of the costly German attacks on the 18th there was quiet for a week—a quiet, however, that was broken by sharp local fighting at various points. Meanwhile French troops had gradually relieved the British in the Kemmel sector between a point north-west of Bailleul and Lagache farm, which they had taken over by the morning of the 21st of April. Various British detachments, totalling about 900 officers and men, were left behind under the general command of the French.

The Attack on Villers-Bretonneux

During the lull in the Lys battle there were indications that the main offensive on the Somme might be resumed. From time to time local attacks had been made on both sides of the Somme, particularly about Hangard in the vicinity of the junction of the British and French armies. In the third week of April an increase in the German artillery east of Villers-Bretonneux was noted, and thereafter abnormal westward movements of troops towards this area were reported from the air.

The railway junction at Chaulnes was reported very active at night. The bombing attacks on the junction by No. 101 on the night of the 18th/19th have already been

referred to. On the three following nights, and again on the 23rd/24th, Chaulnes was attacked, in unfavourable weather, by the same squadron with a total of 171 bombs each of 112-lb. weight. Direct hits on trains moving west from Chaulnes and on the railway track were made. One pilot, Lieutenant S. A. Hustwitt (observer, Lieutenant N. A. Smith), while on his way to Chaulnes on the night of the 19th/20th, saw a train near Rosières and attacked with three 112-lb. bombs which hit the train and started a series of explosions that continued most of the night. At 10.50 p.m. on the 23rd a direct hit was made on an ammunition dump on the railway near Rosières. The dump went up in explosions and fire, and became a beacon for the pilots of the squadron as they went on their way to and from Chaulnes through the night. In addition to this intensive bombing of the railway, No. 101 Squadron attacked, on the same nights, billeting villages east of the line opposite Hangard with a total of three hundred and seventy-eight 25-lb. bombs. The main day bombing in this area was also directed against Chaulnes junction, which was heavily attacked by No. 205 Squadron on the 21st, 23rd, and 24th of April.

The anticipated German attack opened, after a heavy bombardment, about 6.0 a.m. on the 24th of April, and, under cover of fog, enemy tanks broke through the line south of Villers-Bretonneux. These tanks turned north and south, and opened the way for the German infantry, but counter-attacks, and the resistance of British tanks, stemmed the enemy advance. Villers-Bretonneux fell, but was wholly recaptured next day, and the Somme front became quiet once more. On both days when this fighting was in progress the visibility was extremely poor, and there was little flying. Contact patrols by No. 35 Squadron and by No. 3 (Australian Flying Corps) Squadron, made at a height of 100 feet, reported the general situation from time to time, and fighting aircraft of the V Brigade made a few bombing attacks on German troops and batteries. German aircraft were not very active, but the difficult weather conditions, with the added fact that pilots had to fly dangerously low, led

to a number of casualties. One officer was killed, four were missing, and five were wounded by fire from the ground.

It was on the Somme, about this time, that the German air service suffered the loss of its leading fighting pilot, Baron Manfred von Richthofen. The story of his last flight may be recounted in some detail not only for its own interest, but also to illustrate the manner of air fighting at this period. On the morning of Sunday the 21st of April, about 10.30 a.m., Richthofen, with his squadron, left the aerodrome near Cappy. The wind was blowing from the east, a quarter unfavourable to the German pilots. The prevailing winds in France are westerly and the German pilots had seldom to concern themselves with this element. During a 'dog-fight' the combatants usually drifted eastwards, and any German pilot who was forced to land hurriedly could take it for granted that there would be friendly country below him. It was the British pilots who had to reckon with the wind, against which their last fights, often unsuccessful, were waged.

About an hour before Richthofen's squadron left Cappy, three Flights of No. 209 Squadron, totalling fifteen 'Camel' aeroplanes, had left their aerodrome at Bertangles for a routine offensive patrol along the line of the battle-front between Hangard and Albert. The squadron, at 12,000 feet, flew up and down the line, but nothing came to break the monotony of the patrol until 10.25 a.m. when one Flight of the Camels dived away suddenly to attack two two-seater Albatros aeroplanes flying towards the trenches near Beaucourt-en-Santerre. A burst of fire from the leading 'Camel', piloted by Lieutenant M. S. Taylor, sent one of the Albatros aeroplanes down in flames: the other disappeared. Meanwhile Captain A. R. Brown, a Canadian, led the remaining two Flights northwards towards the Somme.

Richthofen, flying westwards along the Somme valley, was now heading for the area. At 10.45 a.m. he appeared over Hamel and saw, below him at 7,000 feet, two R.E.8 aeroplanes which, from No. 3 (Australian Flying Corps) Squadron, were engaged on the photography of a specified

area west of Hamel. Four of Richthofen's squadron dived away to attack the R.E.8's rather in the manner of No. 209 Squadron's earlier attack on the two German two-seaters farther south. The R.E.8's, however, were well handled and gave a good account of themselves. Two of the Fokkers, fired into by the observers' guns from point-blank range, went off, but the others kept up a hot attack. British anti-aircraft guns now opened fire on the German aeroplanes and the characteristic white bursts of their shells attracted the attention of Captain Brown who, although he could as yet distinguish no enemy aeroplanes, signalled to his formation to follow him towards the shell-bursts. As the 'Camels' approached, the flashing wings of the two triplanes still attacking the R.E.8's were seen, and almost at the same moment Captain Brown became aware, on the fringe of the fight, of the main German formation of multi-coloured Fokkers and Albatros Scouts, now numbering some fifteen aeroplanes.

The Flight of 'Camels' which had dived to attack the two Albatros aeroplanes over Beaucourt had not yet rejoined the squadron, and, furthermore, two others of the second Flight had had to turn back with minor troubles. This left eight 'Camels' against the Richthofen 'Circus'. As the 'Camels' approached, Richthofen and the remainder of his pilots turned to engage them and a 'dog-fight' ensued. Lieutenant F. J. W. Mellersh got a burst into one of the Fokker triplanes as it turned away from the R.E.8's to meet the 'Camels': the Fokker went down in a vertical dive, closely followed by Lieutenant Mellersh, and finally landed near Cerisy. Meanwhile the 'Camel', in turn, had been followed down by two other pilots of the 'Circus', and when these attacked him Lieutenant Mellersh spun to within fifty feet of the ground, and then began a 'hedge-hop' flight back to his aerodrome, with the two Fokkers in pursuit.

The general fight had now drifted westwards, away from the area which the R.E.8 officers had been attempting to photograph, and the two Australian pilots thereupon went back over Hamel again and the air observers completed their task.

Richthofen, meanwhile, was in the thick of the encounter, and the 'Camel' pilots, outnumbered, had to fight for their lives. Lieutenant W. J. MacKenzie was hit in the back, but before he was forced to withdraw by the pain of his wound, he turned on the Fokker which had attacked him and sent it down, apparently damaged, with a burst of bullets fired at close range. Second Lieutenant W. R. May, after a sharp engagement with another Fokker, found himself temporarily clear of the fight. He was a newly-joined pilot of the squadron and the orders of his Flight-Commander were that, if he got mixed up in a 'dog-fight', he was to extricate himself at the first opportunity and make straight for home. This he now proceeded to do, but he had not gone far when he became aware of an all-red triplane diving towards him.

At this moment he was seen by Captain Brown who had eluded converging attacks by two Fokkers and was climbing rapidly again to rejoin the other 'Camels' in the main fight. At first Captain Brown thought that Second Lieutenant May (with whom he had been at school in Edmonton, Alberta) was beyond danger, but almost at once he noticed the triplane diving on the tail of the 'Camel'. Soon the 'Camel' was twisting and zigzagging with Richthofen closely following every movement until the moment should arrive when he could, as he had so often done before, begin and end the fight with a short burst of bullets fired from decisive range. Captain Brown was not aware of the identity of the Fokker pilot, but that Second Lieutenant May was in jeopardy was obvious enough, and the Flight-Commander thereupon dived steeply to his subordinate's help. By this time the aeroplanes were near the Australian front-line trenches. Brown came out of his dive above and to the right of Richthofen who, his eyes fixed on the elusive 'Camel' ahead of him, was oblivious of the danger which threatened. The German leader was caught in a position from which few pilots, no matter how skilled or confident, could expect to escape. As a burst of fire came from the twin machine-guns of the 'Camel', Richthofen turned in his cockpit. It seemed to Captain Brown that he then crumpled, and the Fokker zigzagged to

a rough landing two miles inside the British lines. As the red triplane landed, Lieutenant Mellersh passed near by and, looking up, saw Captain Brown turn back to engage the two Fokkers which had pursued him from Cerisy. Captain Brown came up with these, but they withdrew when fired into at long range.¹ In due course all the 'Camel' pilots returned to their aerodrome; the Flight which had early broken away to engage the German two-seaters over Beaucourt had afterwards joined in the fight with Richthofen's 'Circus', but none of the many combats, other than those already given, was decisive. Thus far the facts appear straightforward, but the actions of other participants in this drama remain to be considered. Two Australian Vickers machine-gunners, Sergeant C. B. Popkin and Gunner R. F. Weston, of the 24th Machine-gun Company, were at their gun, mounted for anti-aircraft fire, in a corner of a wood north of the Somme, near Corbie, when a 'Camel' appeared in front of them with a red triplane close behind. According to these and to other witnesses on the ground the triplane appeared to be definitely under the control of its pilot. When the 'Camel' was clear of the sights, the sergeant opened fire on the enemy aircraft which passed over the wood, turned northwards, and then appeared to crash. An Australian staff officer in the wood heard this burst of machine-gun fire and noted, when the red triplane appeared above him, that it was flying unsteadily and did not appear to be under proper control. As the Fokker swerved to the north, it came under fire from two anti-aircraft Lewis guns of the 53rd Battery of the 14th Australian Field Artillery Brigade (Gunnery W. J. Evans and R. Buie). These Lewis gunners, and the crew of the

¹ Captain Brown's combat report, made before he was aware of the German leader's identity, reads: 'Dived on large formation of 15-20 'Albatros Scouts D.5 and Fokker Triplanes, two of which got on my tail 'and I came out. Went back again and dived on pure red triplane which 'was firing on Lieut. May. I got a long burst into him and he went down 'vertical and was observed to crash by Lieut. Mellersh and Lieut. May. 'I fired on two more but did not get them.' A detailed account of the fight, written by Captain Brown, appeared in the American publication, *Liberty*, of Dec. 10th, 1927.

Vickers gun, separately claimed that the German pilot was a victim of their fire.

In an attempt to resolve the various claims at the outset, the body of the dead pilot was examined by four medical officers and their reports showed that Richthofen was struck by one bullet only, which entered the right side of the chest and issued on the left side at a level two inches higher than its entrance. There was evidence that the bullet had been deflected from the spine, but on this point the medical reports were not in agreement. The gun firing the bullet, said the reports, must have been 'situated 'roughly in the same plane as the long axis of the German 'aircraft and fired from the right', and the medical officers were agreed that the entrance and exit wounds were such that they could not have been caused by a bullet fired from the ground. After a careful examination of these and of all other reports, the official decision was that Richthofen was killed by a bullet from the machine-guns of Captain A. R. Brown.

A re-examination of all the evidence, official and unofficial, tends to confirm this decision in the field. The testimony of reputable eyewitnesses leaves no doubt that the triplane was under imperfect control before the Lewis gunners of the 53rd Battery opened fire, nor does it seem possible that the fatal bullet could have come from the Vickers gun of the 24th Machine-gun Company. Brigadier-General J. H. Cannan, commanding the 11th Australian Infantry Brigade, watched the red Fokker come over his head-quarters just when it was fired upon by the Vickers gun to the south. 'The enemy plane', he said in his report, 'immediately swerved to its right and to the ground. . . . 'After it turned the anti-aircraft Lewis guns of the 53rd 'Battery Australian Field Artillery, opened on it. It then 'appeared to turn round in the air and crashed.' Other eyewitnesses in the immediate neighbourhood made similar reports. The positions of this Australian head-quarters and of the relevant machine-gun posts are known exactly, and when they are plotted, and the result studied in conjunction with the evidence of the movements of the Fokker triplane, it is impossible to see how any of the

bullets fired from the specified machine-guns on the ground could have entered the German pilot's body from the right-hand side.¹

The manner of Richthofen's death has received undue attention because of the conflicting claims. The likeliest explanation, that the German leader rallied for a few brief moments after he was mortally wounded in combat and then died fighting is not only the most fitting, but the one most in keeping with his character and record. Manfred von Richthofen was born in Silesia in May 1892, of Prussian stock, and was commissioned in the 1st Regiment of Uhlans in 1912. He saw service with the cavalry from the outbreak of war, but transferred to the German air service as a probationary observer in May 1915. After a brief course of training at Cologne he joined a reconnaissance Flight on the Russian front, but at the end of August 1915 he was transferred to a bombing unit at Ostend, whence he was moved again in September to Champagne. His observer's duties, however, gave him little opportunity to fight enemy aeroplanes, and he chafed to become a single-seater pilot. His response to instruction given by one of his former pilots was not promising, but in November 1915 he was sent to the school at Döberitz near Berlin and eventually succeeded, by stubborn perseverance rather than by natural aptitude, in passing his pilot's tests. He returned to the Western front, to Verdun, in March 1916, joining the so-called 'Second Fighter Squadron' as the pilot of a two-seater aeroplane. But his ambition, as he wrote home, was to go to Boelcke and be one of his disciples, and he took an early opportunity to make a test flight in a single-seater Fokker monoplane, the type with which Boelcke's successes were being won. His attempt failed badly, the Fokker being reduced to scrap in a forced landing due to engine failure, and Richthofen was relegated to fly two-seaters in the less exacting warfare on the

¹ For those students who have access to the squared artillery maps of France, the references are: Map sheet 62D, Scale 1: 40,000. *11th Infantry Brigade head-quarters*, J. 19c.8.5; *24th Machine-gun Company post*, J. 25a.6.9; *53rd Battery Lewis guns*, I. 24b.9.5 and I. 24b.6.5. Richthofen crashed at J. 19b.3.4.

Russian front. There it was that he received an invitation from Boelcke, who was on a visit to his brother, to join a fighter squadron for service in France. There was nothing in Richthofen's record to justify this show of confidence, and it says much for Boelcke's insight into character that he should have chosen this unimpressive pilot, obscure on the Russian front, when many officers, better known and apparently far better qualified, were anxious to join him. Perhaps he gave weight to Richthofen's confidence in himself, to his proved fearlessness and perseverance, and to the fact that he was a first-class sporting shot. The choice was to receive speedy justification. The new Boelcke *Jagdstaffel* opened its long account of successes on the 17th of September, 1916, during the Somme battles, and Richthofen shot down his first British aeroplane, an F.E.2b of No. 11 Squadron, with its two occupants mortally wounded. On the 28th of October 1916 Boelcke was killed, and by the end of the year, Richthofen, with a total of fifteen aeroplanes destroyed, was in command of the Boelcke squadron and was the leading German fighting pilot. Early in the new year he was decorated with the order *Pour le Mérite*. By the end of April 1917 his total of aeroplanes destroyed had increased to fifty-two, and his victims, all members of the British air service, numbered fifty-five dead (including Major L. G. Hawker, V.C.) and twenty-six wounded or prisoners of war. On the 6th of July 1917, in a fight with an F.E., Richthofen was wounded in the head, but was flying again before he had properly recovered from the wound. With the arrival in France of the new British fighters in the summer of 1917, and the increase in the strength of the fighting formations, Richthofen found less opportunity for personal success, but his total mounted steadily to eighty, all of them British aeroplanes, and of their one hundred and three occupants, eighty-seven were killed.

Manfred von Richthofen was a ruthless opponent, but, except in his last fight, he was never reckless. He was courteous and entirely without ill will towards those of his victims who were made prisoners, but in the air he showed no mercy, nor does it appear that he found any aspect of his

duty distasteful. He was fond of hunting and his tactics, more especially in the early part of his career, showed the influence of his sporting experiences. He would stalk his adversary with calculated patience, making the most of every advantage of height, wind, cloud, or sun, to place himself in a favourable position. Most of the other leading fighting pilots of the war, German or Allied, were never unduly concerned with the odds against them, and would often take a sporting chance, but the impression cannot be avoided that Richthofen himself would have another word than sportsmanship to describe such tactics. It would be impertinent to defend his courage or aggressiveness. War, however, was not a game, and he would condemn such tactics as worse than foolish if not absolutely justified by the exigencies of the military situation. His point of view was understood and respected by his British opponents. McCudden tells how, at a dinner in the mess of No. 56 Squadron, Lieutenant A. P. F. Rhys-Davids, who had recently shot down the brilliant Werner Voss, raised his glass and proposed the toast of 'Richthofen, our most worthy enemy'.¹ The fact is that the tactics of the Richthofen 'Circus' were perfectly suited to the conditions under which the German armies fought on the Western front. Those armies were, for the greater part of the war, on the defensive and the German air service was numerically weaker than the combined air services of the Allies. Richthofen's task was to inflict the greatest damage with the minimum of loss to his own service, and he knew that on any day suitable for flying great numbers of aeroplanes of the Royal Flying Corps would be over the German lines. He seldom had to seek combat. It was freely offered to him and he could make his choice, and if it was the part of wisdom to avoid or to break off a fight, Richthofen would never hesitate. The 'Circus' was, therefore, not only extremely active, but also extremely elusive. The German leader showed acumen in his choice of officers and was stern, but patient, in his schooling of them, inspiring them with his own high courage, confidence, and sense of proportion, so that they became one of the most efficient

¹ *Five Years in the Royal Flying Corps*, pp. 254-5.

fighting forces of the war. Manfred von Richthofen had become so much a national hero that his death within the British lines had a depressing effect on the whole German nation. It was the regret of his opponents in the British air service that he did not survive. He was buried at Bertangles, but, in November 1925, his body was exhumed and taken back to Germany.

The Loss of Kemmel Hill

On the 25th of April the battle of the Lys was resumed ^{25 April} with an attack by thirteen German divisions on the French and British positions between Bailleul and the Ypres-Comines canal. The main objective was Kemmel Hill, held by the French with some British detachments, the capture of which would give observation over the northern plain and make the British hold on the Ypres salient insecure. After the usual intensive bombardment, the German infantry, under cover of fog, moved forward from 5.45 a.m. and gradually worked their way round the lower slopes of the hill. Contact-patrol observers who flew over the position at 100 feet could see little of what was happening all the morning, but from noon onwards made many useful reports which showed that, although Kemmel Hill and village were surrounded, British and French troops, isolated in both places, appeared to be holding out long into the afternoon. The main German attack on the British front was made at Wytschaete, and before midday the right of the 9th Division had been forced back to Vierstraat. In the afternoon the attack extended northwards to involve the 21st Division, and by the evening, after a day of bitter fighting in which the German losses were high, the British in this area had been driven back to a line running from Hill 60, north of Vierstraat, to a junction with the French at la Clytte.

During the night of the 24th/25th heavy bombing attacks had been made on the stations at Courtrai, Thourout, and Roulers. On the 25th two pilots of No. 98 (D.H.9) Squadron who attacked Gheluwe with two 230-lb. bombs, reported, on their return, that the Gheluwe-Gheluvelt and Gheluwe-Wervicq roads were congested and partly jammed with

25 April

mechanical transport.¹ Immediately on receipt of this information, the fire of long-range guns was directed along the two roads, and aircraft were sent out to attack the traffic. Twelve D.H.9's of No. 98 Squadron and five of No. 206 Squadron, each carrying one 230-lb. bomb, attacked the roads, but the visibility had become poor again and few results could be observed. Apart from this report of abnormal traffic, air reconnaissances in the afternoon and evening failed to discover any important German concentrations behind the line, and gave a measure of assurance that the scale of the new attack was limited.

The fighter squadrons (Nos. 1, 54, and 74) of the II Brigade made many attacks on ground targets on which they dropped one hundred and fifty 25-lb. bombs and fired many thousands of rounds of ammunition. On the First Army front, which was relatively quiet on this day, the low-bombing attacks by the fighter squadrons were maintained and one hundred and fifty-four 25-lb. bombs were dropped.

German aircraft were extremely active at intervals throughout the 25th, mainly on the front between Bailleul and Kemmel, and they swooped low to make machine-gun attacks on road targets. They frequently interrupted the work of the Corps aeroplanes, and there was much desultory fighting with the British offensive formations. Two German single-seaters were destroyed in the Kemmel area, and two driven down out of control. Four others were brought down by anti-aircraft shells, and two by rifle or machine-gun fire. No British aircraft were lost in the area of the battle, but several flying officers were wounded by fire from the ground and in combat.

It is of interest that arrangements had been made for the squadrons of the head-quarters IX Brigade to revert to low-flying attacks on the enemy, as had been done temporarily during the crisis of the Somme battle in March. General instructions issued to the two wings of the Brigade on the 24th of April stated that it might be

¹ Three D.H.9's had bombed Gheluwe over which they were attacked by seven Pfalz Scouts. One of the D.H.9's was shot down, but the others fought their way home.

necessary to order such low-flying attacks at any time, and outlined the principles to be followed: 'Machines will be employed in attacking detraining points, debussing centres, transport on roads, and troops being brought forward to press home the attack. It will be more important to do this a mile, or two miles behind the front line, than it would be to attack the enemy in the front line itself, because aeroplanes should be employed with a view to preventing the enemy pressing home the full weight of his attack by delaying the advance of his reinforcements, and not with a view to stopping the initial rush; the responsibility for this must necessarily devolve upon the infantry and field artillery.' To lessen the danger, when the line was fluctuating and difficult to identify from the air, of attacks being made on friendly troops, it was ordered that squadron commanders should divide their pilots into two categories, namely, (i) the most reliable and experienced who would be given the duty of attacking enemy troops being brought forward to press home the assault within a mile or two of the line, and (ii) less experienced pilots who would make their attacks four or five miles behind the fighting line. In fact, no such low-flying attacks by the head-quarters squadrons were ordered during the remainder of the Lys battle, but the general instructions are quoted because of their tactical interest.

On the 26th a counter-attack by British and French troops began. Kemmel village was entered by the British, who attacked at 3 a.m., but the French who started a little later were unable to advance very far, and, owing to consequent flanking fire from the north-west, the British troops could not maintain their hold on the village. Later in the morning, the German attacks were renewed in strength, but they made little ground. Locre was captured, but was retaken as a result of persistent French counter-attacks in the evening. The loss of Kemmel Hill and the enemy progress at Voormezele had made the position of the troops in the Ypres salient precarious, and, therefore, during the night of the 26th/27th, they were withdrawn to the general line Pilkem-Wieltje-west end of

Zillebeke lake-Voormezeele. On the 27th and 28th there was local fighting at Voormezeele and Locre which brought no material change in the situation. On the 29th of April, however, the battle blazed up again, and the German infantry, in massed formation, moved forward at 5.40 a.m. through dense mist, against the British and French positions from Locre to Voormezeele. The attacks were beaten off, but were repeated again and again in a day of exceptionally heavy fighting; by the evening, however, except for a small loss of ground at Voormezeele, the British line was still intact. At Locre, where the French had been forced to give ground, the position was mainly restored by counter-attacks. With this day's fighting, during which the enemy suffered abnormal losses for no compensating gains, the battle of the Lys ended. On the 26th, 27th, and 28th of April the weather had been bad and, apart from a few low-bombing and contact-patrol flights, there was little air activity. On the 29th, however, the visibility improved slightly and great numbers of enemy aircraft appeared over the front in support of the German attacks. There were many encounters with British fighters during which four German aeroplanes were destroyed, and another was shot down by infantry fire. One British aeroplane was missing and the observer in another wounded. In spite of the German activity over the battle-front, the observers in the Corps aeroplanes were able to fulfil their duties and were particularly successful in indicating important fleeting targets to the artillery.

The German offensive in the north, with all its possibilities, again threw a great strain on the aircraft supply and repair organization. In anticipation of an advance which might necessitate a hurried evacuation of the aircraft depots and park at St. Omer, Brigadier-General Brooke-Popham had, at the beginning of April 1918, made emergency arrangements to ensure the continuity of supplies to all parks and squadrons of the I and II Brigades. No. I Aircraft Depot at St. Omer was instructed to pack, ready for immediate removal, enough stores to satisfy the

needs of these two brigades for one month. If and when St. Omer was threatened by a German advance, this one month's supply was to be transferred to the former Naval Air Service depot at Guines, south of Calais. There the supplies were to remain intact until definite orders were given for the evacuation of St. Omer, when Guines (known as No. 1 Aircraft Depot Reserve) would begin issue. That is to say, the continuity of supplies was assured during the time required for the removal and re-establishment of the main depot at some centre remote from the danger area.

On the 10th of April, the day after the German advance began, the transfer of the emergency stores to Guines was ordered and, by the 13th, No. 1 Aircraft Depot Reserve was fully ready. By this time the situation on the front had become critical: Merville had fallen and Hazebrouck was threatened. It was deemed prudent to begin the evacuation of the St. Omer depot at once, but until the threat became more pronounced, it was decreed that the daily issue of supplies to parks and squadrons should continue as usual. The bulk stores were to be sent back to a cement factory at Desvres, twenty miles west along the Boulogne road. The repair section of the Aeroplane Supply Depot was to move to the reception aerodrome near Marquise, but the move was to be made gradually and was not to be allowed to interrupt urgent repair work. By the 15th of April, however, there were indications that the German advance was being slowed down and new instructions were issued to the St. Omer depot staff. 'Your whole object now', wrote Brigadier-General Brooke-Popham, 'must be to make yourself at St. Omer as mobile 'as possible, but to be in a position to continue issuing 'from there for an indefinite period.'

In fact, St. Omer continued to issue throughout the Lys battle and the emergency depot at Guines was not called upon. In the middle of May, however, after the battle had ended, the final evacuation of St. Omer was completed. It is of interest that during the night of the 18th of May, just after the evacuation had been completed, eighteen German aeroplanes attacked St. Omer over a period of four hours, dropping about one hundred bombs.

There were, as a result, one hundred and twenty military and civilian casualties, explosions of ammunition, destruction of an aeroplane, and damage to barracks and other buildings. One of the buildings which received a direct hit from a bomb had, up to a few hours before, housed all the engine spare parts in the charge of the St. Omer Aircraft Depot.

The new depot opened at Guines with subsidiary depots at Desvres and at Motteville, near Rouen. The Motteville depot had begun as a dump to which stores arriving for No. 1 Aircraft Depot from England, as well as the more bulky stores from the depot itself, could be sent during the period of uncertainty about the ultimate destination of the depot. In the event of the loss of the Channel ports—a possibility which had also to be taken into account—Motteville, it was considered, would provide a convenient site for the main depot.

The wastage in aircraft during the fighting in March and April had been fairly high. From the beginning of the German offensive on the Somme to the end of the battle on the Lys, 1,032 British aeroplanes had been lost, on the Western front, from all causes, a figure which may be compared with the number of aeroplanes on the strength of all Royal Flying Corps squadrons in France on the 21st of March, namely, 1,232.¹ Of the lost aeroplanes, 195 are shown as missing, 141 as burnt or abandoned after being wrecked, and 696 as wrecked beyond repair. It is possible, and of interest, to particularize these losses according to the types of squadrons. The single-seater fighters, as might be expected, head the list with a loss of 528 (130 missing); the Corps squadrons lost 295 (33 missing); the day-bombers, 117 (18 missing); the fighter-reconnaissance (Bristol Fighter) squadrons, 69 (11 missing); and the night-bombers, 23 (3 missing). The losses during the same period, of equipment and stores, mostly destroyed before being abandoned, were 173 hangars and tents, 2 lorries,

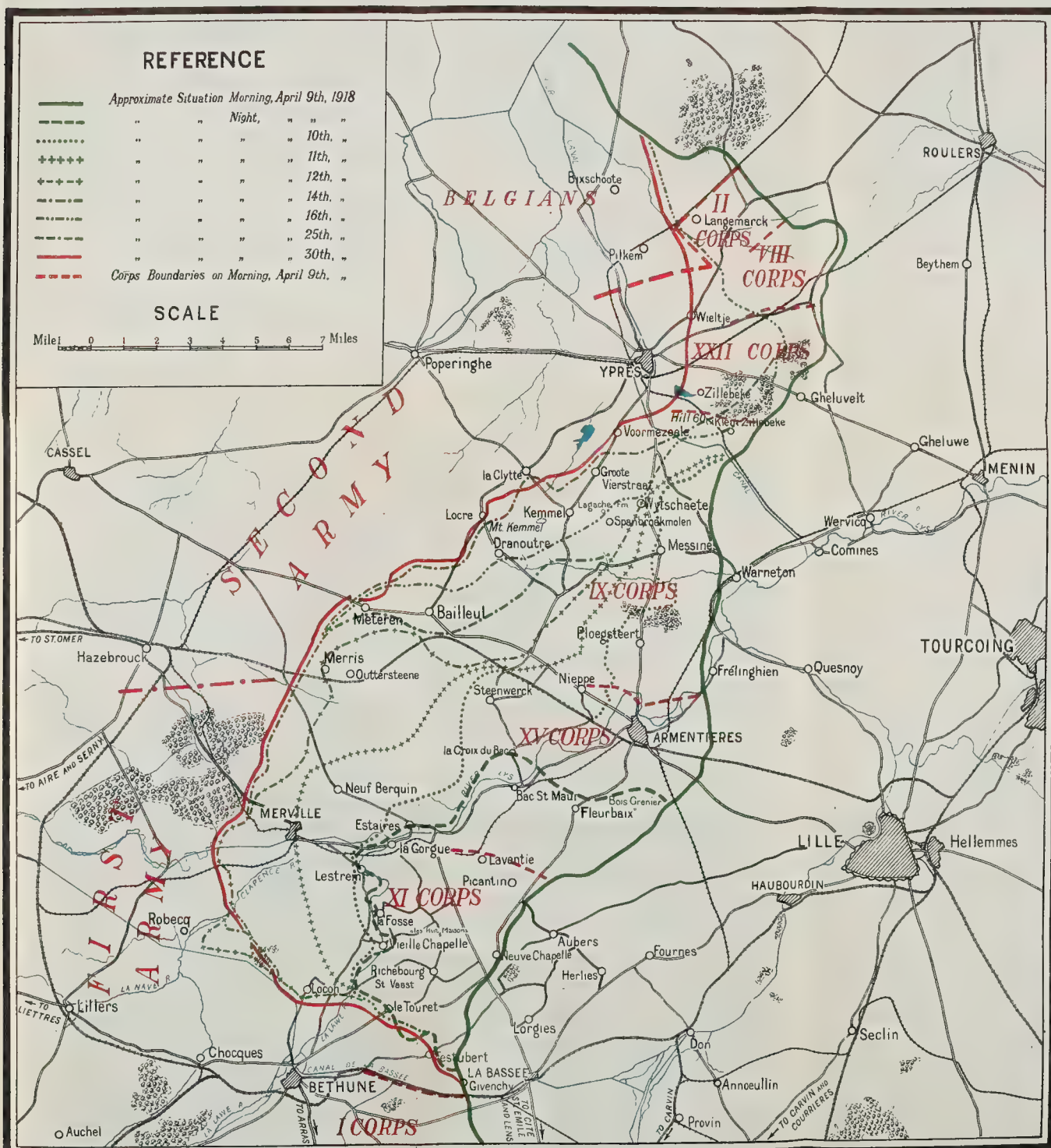
¹ Excluding aircraft directly working with the naval forces in the Belgian coast area, but including the detached bombing squadrons at Ochey, and the naval air squadrons working with the armies.

4 light tenders, 6 motor-cycles, 21 trailers, 37 machine-guns, 1,738 bombs, 60 wireless receiving stations, 4,589 hydrogen tubes, 26,000 gallons of petrol, 2,200 gallons of lubricating oil, and miscellaneous tools.

The activities of the air services during the battle of the Lys were, it has been made clear, limited by the bad weather conditions, but on the 12th of April—the most critical day of the battle—the Royal Air Force, we have seen, was able to put its full weight into the battle. The German air service began well, but tended to become less and less effective as the battle progressed. General von Hoepfner, the German air service commander, supplies an explanation. In his book (*Deutschlands Krieg in der Luft*, pp. 157–8) he says that the Lys battle presented the same characteristics as the Somme battles, namely, absolute superiority of the German air service on the first, and even on the second day, and then, with the arrival of Allied air reinforcements, the passing of this superiority to the Allies. Then followed complaints from the German infantry that they were not being properly protected against British aircraft. It was impossible to find suitable landing-grounds in the devastated battle area, and as the German line advanced, thereby increasing the distance from the aerodromes, all telephonic communication between the air units and the forward troops ceased. It was demonstrated, once again, that without an adequate system of liaison it was impossible to order air operations at the times when they would be most effective. It was essential, said General von Hoepfner, that this state of affairs should be remedied if the spirit of sacrifice displayed by the air squadrons was not to be made in vain. His fears that the new military wireless organization, which had recently been introduced, might adversely affect the efficiency of the aircraft artillery observation were justified by the event. After the initial break-through, the infantry and artillery were working in entirely new territory. It was, therefore, of the utmost importance that the German batteries should make immediate use of information sent down from the air and bombard the enemy whenever and wherever he was signalled by the air observers.

But this depended on adequate liaison between the air and the ground, and between the ground receiving-stations and the batteries. This liaison was wanting. The former wireless operators, supplied by the German air service, who had considered it a point of professional honour that messages received from 'their' aircraft should be properly understood and acted upon, had been dispersed, and their places taken by new personnel, provided by the artillery, who had not the experience fully to comprehend the significance of the air observers' messages. Nor did they understand the working of the signalling panels. Moreover, when the German troops moved forward, many wireless masts were left behind, attempts to supplement wireless communication by the use of the signalling panels were not made, and many of the batteries discarded the special maps indispensable for the understanding of the codified air messages. 'Therefore', says General von Hoepfner, 'the information which the flying officers had risked their lives to obtain was too often not used. Every army which took part in the attacks testified to this striking falling off in the use of artillery aircraft which they all attributed to a lack of instruction of the battery wireless operators. To remedy this state of affairs, wireless schools were organized behind the front, but the effect could not make itself felt until after many months.'

GERMAN OFFENSIVE ON THE LYS, APRIL, 1918.





APPENDICES

APPENDIX I

ADMIRALTY MEMORANDUM ON NAVAL AIR POLICY

(August 1917)

The Air Policy to which the Admiralty is working is as follows:

(1) *Lighter-than-air craft.*

To provide a type of airship, in sufficient numbers, which will be able to scout with the Fleet, and, in this respect, to perform the duty of light cruisers.

To provide also a type of airship for coastal patrol work and for escort of merchant ships and convoys unless and until this duty can be performed by heavier-than-air craft.

To provide also a sufficient number of kite balloons for the work which is required of them in the Fleet, in destroyer flotillas which are engaged in submarine hunting or in convoy work, and in trawler flotillas engaged in similar duties.

(2) *Heavier-than-air machines.*

(a) Those for use in seaplane carriers.

Under this heading the policy is to provide a sufficient number for reconnaissance, for engaging enemy aircraft, for observation of fire and for torpedo carrying. The policy also is to provide, when conditions admit, a sufficient number of seaplane carriers to work with the Grand Fleet, with the Harwich Flotilla, the Dover Patrol, Tenth Cruiser Squadron, Ireland, Gibraltar, and the Mediterranean.

(b) To provide also, when a satisfactory type is evolved, a sufficient number of lighters for carrying seaplanes for extended reconnaissance and for engaging enemy aircraft in Southern waters.

(c) The provision of heavier-than-air craft apart from Fleet work.

The policy is to provide machines for offensive action against submarines, mine-laying and attack of enemy aircraft, detection of mine-fields, protection of trade (by patrol or convoy), reconnaissance of such places as the Belgian coast and other enemy naval bases within reach of this type of machine.

To provide also torpedo-carrying seaplanes for work against the enemy bases in the Mediterranean, in addition to aircraft to carry out in the Mediterranean duties similar to those for which they are required in home waters.

(d) The policy also is to develop wireless, D.C.B.'s (Distant Control Boats), and vessels of larger type, dependent upon the result of experiments now in progress.

It must be recognized that it is one thing to lay down policy, and another, quite a different one, to carry it out after three years of war, when difficulties of every sort connected with the supply of labour and material are met with in every direction, and therefore, although the policy is as above mentioned, it may be anticipated that very considerable delays will be experienced in carrying out that policy.

23/8/17.

APPENDIX II

ANTI-SUBMARINE RESULTS

By Various Types of Aircraft, 1917
Compiled by the War Flight, Felixstowe

	<i>Airships.</i>		<i>Flying-boats.</i>		<i>Float Machines.</i>		<i>Land Machines.</i>	
	<i>Submarines sighted.</i>	<i>Submarines bombed.</i>	<i>Submarines sighted.</i>	<i>Submarines bombed.</i>	<i>Submarines sighted.</i>	<i>Submarines bombed.</i>	<i>Submarines sighted.</i>	<i>Submarines bombed.</i>
Bembridge .	..	..	..	..	5	4	..	..
Calshot .	..	..	3	3	2	1	..	..
Cattewater .	..	..	1	1	4	3	..	..
Cherbourg .	..	..	..	..	8	4	..	..
Dover .	..	..	..	..	1	..	..	..
Dunkirk .	..	..	2	2	12	4	..	..
Dundee .	..	..	..	..	2	2	..	..
Fishguard .	..	..	..	..	1	1	..	..
Folkestone .	1	..	..	..	..	..	..	..
Felixstowe .	..	..	44	25	..	..	..	..
Hornsea .	..	..	..	..	1	1	..	..
Howden .	1	..	..	..	..	..	..	..
Killingholme .	..	..	3	2	..	..	..	..
Longside .	2	..	..	..	..	..	..	..
Mullion .	17	12	..	..	..	..	..	..
Newlyn .	..	..	..	..	6	4	..	..
Newhaven .	..	..	..	..	5	4	..	..
Portland .	..	..	..	..	5	3	..	..
Pulham .	1	..	..	..	..	..	..	..
Polegate .	1	..	..	..	..	..	..	..
Pembroke .	5	4	..	..	..	..	..	..
Riviera .	..	..	..	..	3	2	..	..
Redcar .	..	..	..	..	..	..	6	4
Scilly .	..	..	12	8	..	..	..	..
South Shields .	..	..	..	..	1	1	..	..
Seaton Carew .	..	..	..	..	2	1	..	..
Westgate .	..	..	..	..	4	3	..	..
Yarmouth .	..	..	3	3	4	3	..	..
TOTALS .	28	16	68	44	66	41	6	4

PROPORTIONS

	<i>Submarines sighted.</i>		<i>Submarines bombed.</i>	
	<i>Number.</i>	<i>Proportion of total.</i>	<i>Number.</i>	<i>Proportion of total.</i>
Airships .	28	% 17	16	% 15
Flying-boats .	68	40½	44	42
Float Machines .	66	39½	41	39
Land Machines .	6	3	4	4
TOTALS .	168	100	105	100

APPENDIX III

ORDER OF BATTLE OF THE ROYAL FLYING CORPS ON 7TH JUNE, 1917 (MESSINES)

General Officer Commanding: Major-General H. M. Trenchard, C.B.,
D.S.O., A.D.C., St. André-aux-Bois (Advanced H.Q., St. Omer).

Ninth (H.Q.) Wing: Lt.-Col. C. L. N. Newall Boisdingham
Squadrons.

19 (Spad) Maj. W. D. S. Sanday, D.S.O., M.C.	Liettres (Estrée Blanche)
27 (Martinsyde Scout) Maj. S. Smith, D.S.O.	Clairmarais
55 (D.H.4) Maj. J. E. A. Baldwin	Boisdingham
56 (S.E.5) Maj. R. G. Blomfield	Liettres
66 (Sopwith 'Pup') Maj. O. T. Boyd, M.C.	Liettres
70 (Sopwith 2-seater) Maj. A. W. Tedder	Boisdingham
Special Duty Flight (B.E.12 and 2e)	
Capt. J. W. Woodhouse, D.S.O., M.C.	Clairmarais
<i>Total aeroplanes on charge</i>	116
57 (re-equipping with D.H.4) Maj. L. A. Pattinson, M.C.	Fienvillers

H.Q. I Brigade. Brig.-Gen. G. S. Shephard, M.C. Divion

H.Q. First (Corps) Wing. Lt.-Col. T. W. C.
Carthew, D.S.O. Bruay

Corps Squadrons.

I	2 (Armstrong-Whitworth) Maj. R. A. Cooper	Hesdigneul
XIII	5 (R.E.8) Maj. E. J. Tyson, M.C.	Acq
XI	10 (B.E.2e, f, and g) Maj. G. B. Ward, M.C.	Chocques
Canadian.	16 (R.E.8) Maj. P. C. Maltby, D.S.O.	Camblain l'Abbé
<i>Total aeroplanes on charge</i>		73

H.Q. Tenth (Army) Wing. Lt.-Col. W. R.
Freeman, D.S.O., M.C. Château du Reveillon
(Chocques)

Squadrons.

8 Naval (Sopwith Triplane) Sqdn.-Cdr. G. R. Bromet	Mont St. Eloi
23 (Spad) Maj. A. M. Wilkinson, D.S.O.	Bruay (2 Flights Erquinghem)
25 (F.E.2d) Maj. Hon. O. M. Guest . .	Auchel (Lozinghem)
40 (Nieuport Scout) Maj. A. W. Keen .	Bruay

H.Q. Tenth (Army) Wing—Squadrons (cont.)

43 (Sopwith 2-seater) Maj. A. S. W.	
Dore	Auchel
100 (B.E.2e and F.E.2b) Maj. M. G.	
Christie, D.S.O., M.C.	Treizennes
<i>Total aeroplanes on charge</i>	103

H.Q. First Balloon Wing. Lt.-Col. P. K.

Wise, D.S.O. Noeux-les-Mines

Companies 1 (Capt. W. Wallace, Sections
8 and 20)

2 (Maj. F. M. Roxby, 10 and 24)

3 (Capt. O. Hook, *19, 30, and 37)

4 (Capt. J. R. Bedwell, 40 and 42)

First Army Aircraft Park. Maj. N. Goldsmith Lillers

*H.Q. II Brigade. Brig.-Gen. T. I. Webb-Bowen Oxelaere (Cassel)**H.Q. Second (Corps) Wing. Lt.-Col. C. F. de S.*

Murphy, D.S.O., M.C. Bailleul

Corps. Squadrons.

II 4 (R.E.8) Maj. L. Jenkins, M.C. Abeele

X 6 (R.E.8) Maj. A. S. Barratt, M.C. Abeele

† 7 (B.E.2e) Maj. A. T. Whitelock Proven.

VIII 21 (R.E.8) Maj. P. E. L. Gethin La Lovie

II (Anzac) 42 (R.E.8) Maj. J. L. Kinnear,
M.C. Bailleul

IX 53 (R.E.8) Maj. C. S. Wynne-Eyton Bailleul

Total aeroplanes on charge 117

H.Q. Eleventh (Army) Wing. Lt.-Col. G. B.

Stopford St. Sylvestre

Squadrons.

I (Nieuport Scout) Maj. G. C. St. P. de
Dombasle Bailleul

I Naval (Sopwith Triplane) Sqdn.-Cdr.
F. K. Haskins, D.S.C. Bailleul

10 Naval (Sopwith Triplane) Sqdn.-
Cdr. B. C. Bell, D.S.O. Droglandt

20 (F.E.2d) Maj. W. H. C. Mansfield,
D.S.O. St. Marie-Cappel

41 (F.E.8) Maj. J. H. A. Landon Hondschoote

45 (Sopwith 2-seater) Maj. H. A. Van
Ryneveld, M.C. St. Marie-Cappel

46 (Sopwith 'Pup') Maj. P. Babington,
M.C. La Gorgue

Total aeroplanes on charge 115

* 19 attached Cavalry Corps.

† No. 7 Squadron sent 6 aeroplanes to each of Nos. 6, 21, and 42 Squadrons as reinforcements.

ORDER OF BATTLE (MESSINES)

411

H.Q. Second Balloon Wing. Lt.-Col. W. F. MacNeece, D.S.O. Mont Rouge
Companies 5 (Maj. C. H. Stringer, Sections 2, 25, and 34)

6 (Capt. H. P. L. Higman, 9 and 32)
 7 (Capt. F. X. Russell, 15, 22, and 38)
 8 (Capt. H. M. Meyler, M.C., 23 and 39)
 13 (Maj. G. A. N. Mitchell, 3 and 4)
 20 (Capt. R. W. Bruce, H.Q. only)

Second Army Aircraft Park. Maj. H. Lee . Hazebrouck

H.Q. III Brigade. Brig.-Gen. J. F. A. Higgins, D.S.O. Avesnes-le-Comte

H.Q. Twelfth (Corps) Wing. Lt.-Col. W. G. S. Mitchell, M.C. Arqueves

Corps. Squadrons.

IV 3 (Morane Parasol) Maj. E. D. Horsfall, M.C. Laviéville

VII 8 (B.E.2e) Maj. E. L. Gossage, M.C. Boiry St. Martin

VI 12 (B.E.2e) Maj. C. S. Burnett Wagnonlieu

XVII 13 (B.E.2e) Maj. E. W. Powell . Etrun

V 15 (R.E.8 and B.E.2e) Maj. H. S. Walker . Courcelles-le-Comte

XVIII 59 (R.E.8) Maj. R. Egerton, M.C. Le Hameau

Total aeroplanes on charge 106

H.Q. Thirteenth (Army) Wing. Lt.-Col. G. F. Pretymann, D.S.O. Toutencourt

Squadrons.

3 Naval (Sopwith 'Pup') Sqdn.-Cdr. R. H. Mulock, D.S.O. Marieux

11 (F.E.2b and Bristol Fighter) Maj. C. T. MacLean, M.C. Bellevue

18 (F.E.2b) Maj. G. R. M. Reid, M.C. . Baizieux

29 (Nieuport Scout) Maj. H. V. Champion de Crespigny, M.C. Le Hameau

32 (D.H.2 and D.H.5) Maj. T. A. E. Cairnes, D.S.O. Lealvillers

48 (Bristol Fighter) Maj. A. V. Bettington Bellevue

60 (Nieuport Scout) Maj. A. J. L. Scott Le Hameau

Total aeroplanes on charge 122

H.Q. Third Balloon Wing. Lt.-Col. F. H. Cleaver, D.S.O. Biefvillers-les-Bapaume

Companies 9 (Capt. G. S. Sansom, M.C., Sections 7 and 21)

10 (Maj. E. J. E. Hawkins, 5 and 28)

11 (Capt. H. F. Wright, 16 and 33)

H.Q. Third Balloon Wing—Companies (cont.)

12 (Capt. W. S. Huxley, 35 and 36)

17 (Capt. F. C. Mears, 13 and 18)

18 (Capt. E. B. Cowell, 1 and 31)

19 (Capt. N. J. A. L. Prinsep, 11)

Fifth Army Aircraft Park. Maj. M. Spicer . Puchevillers

Third Army Aircraft Park. Maj. R. Hall

(Pending withdrawal) . . . Frévent

H.Q. IV Brigade. Brig.-Gen. J. H. W. Becke,

D.S.O. . . . Misery

*H.Q. Third (Corps) Wing. Lt.-Col. E. R.*Ludlow-Hewitt, M.C. . . . Ferme de Bias
(Bouvincourt)*Corps. Squadrons.*

* 9 (B.E.2e and R.E.8) Maj. H. J. F.

Hunter, M.C. . . . Estrées-en-Chaussée

† 34 (R.E.8) Maj. A. H. Morton, M.C.

Nurlu

Cavalry 35 (A.W.) Maj. A. V. Holt .

Mons-en-Chaussée

III 52 (R.E.8) Maj. A. A. Walser, M.C.

Longavesnes

*Total aeroplanes on charge . . . 71**H.Q. Fourteenth (Army) Wing. Lt.-Col. R.*

Lorraine, M.C. . . . Flez

Squadrons.

6 Naval (Nieuport Scout) Sqdn.-Cdr.

C. D. Breese . . . Flez

22 (F.E.2b) Maj. L. W. Learmount,

D.S.O., M.C. . . . Flez

24 (D.H.2 and D.H.5) Maj. A. G.

Moore, M.C. . . . Flez

54 (Sopwith 'Pup') Maj. K. K. Horn . Flez

*Total aeroplanes on charge . . . 58**H.Q. Fourth Balloon Wing. Lt.-Col. Hon.*

J. D. Boyle . . . Eterpigny

Companies 14 (Capt. E. L. B. Buchanan, Sections 14 and 29)

15 (Maj. E. B. Broughton, 6 and 41)

16 (Capt. Hon. E. G. W. T. Knollys, 12 and 43)

Fourth Army Aircraft Park. Maj. A. Levick . Eterpigny

No. 1 Aircraft Depot. Lt.-Col. R. H. Collier . St. Omer

No. 2 Aircraft Depot. Lt.-Col. A. Christie . Candas

Engine Repair Shops. Lt.-Col. G. B. Hynes,

D.S.O. . . . Pont de l'Arche, Rouen

R.F.C. Port Depot. 2nd Lt. J. H. B. Foss . Le Havre

Strength: 50 Squadrons (excluding No. 57 Squadron)

1 Special Duty Flight

881 aeroplanes

40 K.B. Sections

* Re-equipping and resting.

† In process of moving.

DAILY ARTILLERY RESULTS BY THE SECOND (CORPS) WING—15th MAY TO 9TH JUNE, 1917

Date.	German batteries: (a) engaged for destruction, (b) neutralized.		Gunpits: (a) destroyed, (b) damaged.		Trench bombardments.	Zone calls: (a) sent, (b) answers observed.		Registrations.	Weather.
	(a)	(b)	(a)	(b)		(a)	(b)		
15th	5	3	1	3	5	12	(b)	7	Fair
16th	..	..	..	..	..	..	3	..	Very bad
17th	..	..	..	..	..	..	..	..	Very bad
18th	8	..	..	..	..	5	..	1	Fair
19th	10	1	1	9	12	18	6	3	Fair
20th	16	2	..	2	7	27	4	10	Fine
21st	4	2	8	10	18	6	4	6	Fine
22nd	6	2	..	3	6	22	8	..	Fair
23rd	13	2	..	4	15	17	6	5	Fine
24th	8	2	2	12	20	30	7	8	Fine
25th	19	7	2	7	19	27	6	3	Fine
26th	26	6	9	18	16	13	3	4	Fine
27th	26	3	5	18	46	21	1	7	Fine
28th	25	1	12	9	29	9	3	4	Fine
29th	11	..	7	13	30	3	..	3	Very bad
30th	7	1	..	13	7	11	1	8	Fair
31st	10	..	5	7	15	3	..	6	Fair
1st	34	3	8	18	22	28	3	19	Fine
2nd	26	7	7	11	32	56	7	12	Fine
3rd	33	15	9	17	53	58	15	16	Fine
4th	39	16	10	33	41	75	16	21	Fine
5th	45	13	19	27	35	77	13	12	Fine
6th	50	3	27	36	38	24	3	19	Fine
7th	4	153	2	1	19	398	165	3	Fine
8th	25	24	4	11	5	84	24	15	Fine
9th	13	34	2	15	6	164	41	22	Fine
					5				

APPENDIX V

ORDER OF BATTLE OF THE ROYAL FLYING CORPS ON 31ST JULY, 1917 (YPRES)

General Officer Commanding: Major-General H. M. Trenchard, C.B.,
D.S.O., A.D.C., St. André-aux-Bois (Advanced H.Q., St. Omer).

No. 101 Squadron (equipping with F.E.2b's)
Maj. Hon. L. J. E. Twisleton-Wykeham-
Fiennes St. André-aux-Bois
H.Q. Ninth (H.Q.) Wing. Lt.-Col. C. L. N.
Newall Boisdingham

Squadrons.

19 (Spad) Maj. W. D. S. Sanday, D.S.O.,
M.C. Liettres (Estrée Blanche)
27 (Martinsyde Scout) Maj. S. Smith,
D.S.O. Clairmarais
55 (D.H.4) Maj. J. E. A. Baldwin . . . Boisdingham
56 (S.E.5 and S.E.5a) Maj. R. G.
Blomfield Liettres
66 (Sopwith 'Pup') Maj. G. L. P.
Henderson, M.C. Liettres
70 (Sopwith 'Camel') Maj. M. H. B.
Nethersole Liettres
Special Duty Flight (B.E.12, 12a, and 2e)
Capt. J. W. Woodhouse, D.S.O.,
M.C. Clairmarais
Total aeroplanes on charge . . . 111

H.Q. I Brigade. Brig.-Gen. G. S. Shephard,
D.S.O., M.C. Divion
H.Q. First (Corps) Wing. Lt.-Col. T. W. C.
Carrhew, D.S.O. Bruay

Corps. Squadrons.

I 2 (Armstrong Whitworth) Maj.
R. A. Cooper, D.S.O. Hesdigneul
XIII 5 (R.E.8) Maj. E. J. Tyson, M.C. . . . Acq
XI 10 (A.W.) Maj. G. B. Ward, M.C. Chocques
* 15 (R.E.8) Maj. H. S. Walker La Gorgue
Canadian 16 (R.E.8) Maj. C. F. A. Portal,
D.S.O., M.C. Camblain-l'Abbé
Cavalry 35 (A.W.) Maj. A. V. Holt Savy
Total aeroplanes on charge . . . 97

* G.H.Q. Reserve (resting), with exception of 'C' Flight detached to V
Brigade at Clairmarais for practice contact-patrol work with VIII Corps.

ORDER OF BATTLE (YPRES)

415

H.Q. Tenth (Army) Wing. Lt.-Col. W. R.

Freeman, D.S.O., M.C. Château du Reveillon
(Chocques)

Squadrons.

8 Naval (Sopwith Triplane and 'Camel')
Sqn.-Cdr. G. R. Bromet Mont St. Eloi
25 (D.H.4 and F.E.2d) Maj. Hon. O. M.
Guest Auchel (Lozinghem)
40 (Nieuport Scout) Maj. L. A. Tilney . Bruay
43 (Sopwith 2-seater) Maj. A. S. W.
Dore Auchel
100 (F.E.2b and B.E.2e) Maj. M. G.
Christie, D.S.O., M.C. Treizennes
Total aeroplanes on charge 77

H.Q. First Balloon Wing. Lt.-Col. P. K.

Wise, D.S.O. Béthune

Companies 1 (Capt. R. C. Talbot, Sections 8 and 20)
2 (Maj. F. M. Roxby, *19, 10, and 24)
3 (Capt. G. Disney, 30 and 37)
4 (Capt. J. R. Bedwell, 40, 42, and 46)
16 (Capt. Hon. E. G. W. T. Knollys, 12 and 43)

First Army Aircraft Park. Maj. N. Goldsmith Houdain

H.Q. II Brigade. Brig.-Gen. T. I. Webb-Bowen Oxelaere (Cassel)

H.Q. Second (Corps) Wing. Lt.-Col. C. F. de S.

Murphy, D.S.O., M.C. Mont Rouge

Corps. Squadrons.

X 6 (R.E.8) Maj. A. W. H. James,
M.C. Abeele
II (Anzac) 42 (R.E.8) Maj. J. L. Kinnear,
M.C. Bailleul
IX 53 (R.E.8) Maj. C. S. Wynne-
Eyton Bailleul
Total aeroplanes on charge 55

H.Q. Eleventh (Army) Wing. Lt.-Col. A. J. L.

Scott, M.C. St. Sylvestre

Squadrons.

I (Nieuport Scout) Maj. A. Barton
Adams Bailleul
1 Naval (Sopwith Triplane) Sqn.-Cdr.
R. S. Dallas, D.S.C. Bailleul
20 (F.E.2d) Maj. W. H. C. Mansfield,
D.S.O. St. Marie-Cappel
45 (Sopwith 2-seater and 'Camel') Maj.
H. A. Van Ryneveld, M.C. . . . St. Marie-Cappel
Total aeroplanes on charge 68

* 19 attached Cavalry Corps.

ORDER OF BATTLE (YPRES)

H.Q. Second Balloon Wing. Lt.-Col. W. F.

MacNeece, D.S.O. Mont Rouge

Companies 5 (Maj. H. M. Meyler, M.C., Sections 2, 25, and 47)

6 (Capt. H. P. L. Higman, 9 and 32)

7 (Capt. F. X. Russell, 15 and 38)

11 (Capt. H. F. Wright, 16 and 33)

Second Army Aircraft Park. Maj. H. Lee . Hazebrouck

H.Q. III Brigade. Brig.-Gen. J. F. A. Higgins,

D.S.O. Albert

H.Q. Twelfth (Corps) Wing. Lt.-Col. W. G. S.

Mitchell, M.C. Biefvillers-les-Bapaume

Corps. Squadrons.

IV 3 (Morane Parasol) Maj. J. A. G.

De Courcy, M.C. Longavesnes

VII 8 (B.E.2e) Maj. E. L. Gossage,

M.C. Boiry St. Martin

VI 12 (B.E.2e) Maj. C. S. Burnett . Ablainzevelle

XVII 13 (R.E.8) Maj. E. W. Powell . Etrun

III 59 (R.E.8) Maj. R. Egerton, M.C. Mons-en-Chaussée

Total aeroplanes on charge . . . 90

H.Q. Thirteenth (Army) Wing. Maj. C. T.

MacLean, M.C. (temporary) . . . Toutencourt

Squadrons.

11 (Bristol Fighter) Capt. R. Raymond

Barker (temporary) Bellevue

18 (F.E.2b and D.H.4) Maj. G. R. M.

Reid, M.C. Bellevue

22 (Bristol Fighter) Maj. L. W. Lear-

mount, D.S.O., M.C. Le Hameau

24 (D.H.5) Maj. A. G. Moore, M.C. . Baizieux

41 (D.H.5) Maj. J. H. A. Landon, D.S.O. Lealvillers

60 (Nieuport Scout and S.E.5) Maj.

W. J. C. Kennedy-Cochran-Patrick,

D.S.O., M.C. Le Hameau

Total aeroplanes on charge . . . 86

H.Q. Third Balloon Wing. Lt.-Col. F. H.

Cleaver, D.S.O. Biefvillers-les-Bapaume

Companies 10 (Maj. E. J. E. Hawkins, Sections 5 and 28)

12 (Capt. W. S. Huxley, 35 and 45)

14 (Capt. E. L. B. Buchanan, 14 and 29)

15 (Maj. J. H. Davies, 6 and 41)

18 (Capt. E. B. Cowell, 1 and 31)

19 (Capt. N. J. A. L. Prinsep, 11 and 44)

Third Army Aircraft Park (Northern). Maj.

R. Hall Puchevillers

Third Army Aircraft Park (Southern). Maj.

A. F. A. Hooper Eterpigny

<i>H.Q. IV Brigade.</i> Brig.-Gen. J. H. W. Becke,	
D.S.O.	Zuydcoote
<i>H.Q. Third (Corps) Wing.</i> Lt.-Col. E. R.	
Ludlow-Hewitt, M.C.	Zuydcoote
<i>Corps. Squadrons.</i>	
XV 34 (R.E.8) Maj. C. H. B. Blount,	
M.C.	Bray Dunes
XV 52 (R.E.8) Maj. A. A. Walser, M.C.	Bray Dunes
<i>Total aeroplanes on charge</i>	36
<i>H.Q. Fourteenth (Army) Wing.</i> Lt.-Col.	
R. P. Mills, M.C.	Frontier Aerodrome (Bray Dunes)
<i>Squadrons.</i>	
6 Naval (Sopwith 'Camel') Sqdn.-Cdr.	
C. D. Breese	Frontier Aerodrome
9 Naval (Sopwith 'Camel' and Triplane)	
Sqdn.-Cdr. H. Fawcett	Leffrinckhoucke
48 (Bristol Fighter) Maj. A. V. Bettington	Frontier Aerodrome
54 (Sopwith 'Pup') Maj. K. K. Horn .	Leffrinckhoucke
<i>Total aeroplanes on charge</i>	66
No. 9 Balloon Company (Capt. G. S. Sansom,	
M.C., Sections 7 and 21)	
Fourth Army Aircraft Park. Maj. A. Levick	Coudekerque
<i>H.Q. V Brigade.</i> Brig.-Gen. C. A. H. Longcroft.	
	Châlet d'Amitié (Poperinghe)
<i>H.Q. Fifteenth (Corps) Wing.</i> Lt.-Col. J. G.	
Hearson, D.S.O.	Near Châlet d'Amitié
<i>Corps. Squadrons.</i>	
II 4 (R.E.8) Maj. L. Jenkins, M.C. .	Abeele
XVIII 7 (R.E.8) Maj. A. T. Whitelock .	Proven
XIV 9 (R.E.8) Maj. H. J. F. Hunter,	
M.C.	Proven
XIX 21 (R.E.8) Maj. L. T. N. Gould,	
M.C.	La Lovie
<i>Total aeroplanes on charge</i>	86
<i>H.Q. Twenty-Second (Army) Wing.</i> Lt.-Col.	
F. V. Holt, D.S.O.	Near Châlet d'Amitié
<i>Squadrons.</i>	
10 Naval (Sopwith Triplane) Sqdn.Cdr.	
B. C. Bell, D.S.O., D.S.C.	Droglandt
23 (Spad) Maj. A. M. Wilkinson, D.S.O.	La Lovie
29 (Nieuport Scout) Maj. C. M. B.	
Chapman, M.C.	Poperinghe
32 (D.H.5) Maj. T. A. E. Cairnes, D.S.O.	Droglandt
57 (D.H.4) Maj. L. A. Pattinson, M.C.	Boisdinghem
<i>Total aeroplanes on charge</i>	86

ORDER OF BATTLE (YPRES)

H.Q. Fifth Balloon Wing. Lt.-Col. Hon. A. S.

Byng Near Châlet d'Amitié

Companies 8 (Capt. J. A. Cochrane, Sections 23 and 39)

13 (Maj. G. A. N. Mitchell, 3, 4, and 36)

17 (Capt. F. C. Mears, 13 and 18)

20 (Capt. R. W. Bruce, 22 and 34)

Fifth Army Aircraft Park. Maj. M. Spicer . Herzele

No. 1 Aircraft Depot. Lt.-Col. R. H. Collier . St. Omer

No. 2 Aircraft Depot. Lt.-Col. A. Christie . Candas

Engine Repair Shops. Lt.-Col. G. B. Hynes,

D.S.O. Pont de l'Arche, Rouen

R.F.C. Port Depot. 2nd Lt. J. H. B. Foss . Le Havre

Strength: 50 Squadrons (excluding No. 101 Squadron)

1 Special Duty Flight

858 aeroplanes

44 K.B. Sections

APPENDIX VI

BATTLES OF YPRES, 1917

ORDERS FOR BOMBING AND MACHINE-GUN ATTACKS

Issued by Advanced General Head-quarters, Royal Flying Corps, 25th July, 1917 (G.S. 21/1)

I Brigade

II Brigade

V Brigade

Ninth Wing

R.N.A.S. Dunkirk

Fifth Army

Aviation, French First Army

Aviation, Belgian Army

IV Brigade

} For information.

1. The following operations will be carried out in connexion with forthcoming operations.

2. On the night of Y/Z [i.e. 30th/31st July 1917]—

(a) All available machines of No. 100 Squadron will bomb the following aerodromes, starting as early as possible:

Ingelmunster

Heule

Marcke

(b) Machines will subsequently make a second trip and bomb any camps, billets, dumps, trains, railway stations or lighted aerodromes seen in the area Ypres—Menin—Courtrai—Ingelmunster—Roulers—Bixchoote.

R.F.C. H.Q. ORDERS (25 JULY 1917) 419

N.B. The type of bomb for both raids is left to O.C., No. 100 Squadron.

(c) The G.O.C. would be glad if the Senior Officer, R.N.A.S. Dunkirk, could consider the possibility of bombing the railway stations at Cortemarck, Lichtervelde, and Thourout during the night.¹

3. On Z day [i.e. 31st July]—

(a) *Attack of aerodromes with M.G. fire:*

(i) O.C., 9th Wing, will detail 5 machines, one to attack each of the following aerodromes in the early morning with M.G. fire from a low altitude:

Marcke
Bisseghem
Heule
Abeelhoek
Ingelmunster

Machines will start as early as possible in order to arrive at their respective objectives as soon as it is light enough for accurate shooting.

(ii) The G.O.C. wishes the Brigadiers-General commanding 2nd and 5th Brigades to consider the possibility of attacking any or all of the following aerodromes in the same way:²

2nd Brigade: Mouveaux
Herseaux
Coucou
Reckem

5th Brigade: Beveren
Lichtervelde
Handzaeme
Thourout

(b) *Bombing of Aerodromes.*

(i) O.C., 9th Wing, will bomb the following aerodromes three times each from a height with formations of 6 machines, 2 aerodromes to be bombed by Martinsydes and 1 by De Havilland 4's:

Marcke
Heule
Ingelmunster

20-lb. bombs will be used.

(ii) The G.O.C. wishes the B.G.C., 5th Brigade, to consider the possibility of bombing:

Lichtervelde
Rumbeke

aerodromes in the same way.³

¹ *Author's Note:* Captain C. L. Lambe, R.N., agreed to undertake the bombing of these stations.

² *Author's Note:* The attacks were ordered by the two Brigade Commanders.

³ *Author's Note:* This was ordered.

- (iii) The G.O.C. would be glad if the Senior Officer, R.N.A.S. Dunkirk, could consider the possibility of bombing:

Varssenaere
Snelleghem
aerodromes in the same way.¹

4. On the night of Z/Z+1 [i.e. 31st July/1st August]—

(a) All available machines of No. 100 Squadron will bomb Ingelmunster station.

(b) Machines will subsequently bomb trains on the lines radiating from Menin—Courtrai—Ingelmunster and Roulers.

If no trains are seen, bombs will be dropped on the railway stations at either of the above places.

N.B. The type of bomb for both raids is left to the O.C., No. 100 Squadron.

5. Acknowledge.

P. GAME,
Brigadier-General,
General Staff.

Advanced H.Q., R.F.C.,
25th July 1917.

SUPPLEMENTARY ORDERS

(a)

1. In continuation of my G.S. 21/1 of the 25th instant, the O.C., 9th Wing, will detail the following on Z day:

(a) Two machines to fire on troops, transport, and motor-cars from a low altitude east of the line Dadizeele—Staden. Machines will be independent of one another. The first two will leave the ground one hour after zero, or as soon after as weather and the light permit. The attack will be kept up as continuously as possible throughout the day.

(b) Offensive patrols throughout the day—

(I) On the line Comines—Harlebeke.

(II) On the line Staden—Ingelmunster.

2. The G.O.C. wishes the B.G.C., 5th Brigade, to consider the possibility of carrying out attacks similar to those ordered in 1 (a) west of the line Dadizeele—Staden.

3. Acknowledge.

27/7/17.

¹ *Author's Note:* Captain Lambe undertook to make at least two day attacks, and if possible, three, on each of the two aerodromes.

(b)

Reference Orders for Z day to 5th Brigade in G.S. 21/1 dated 25th July; G.O.C. telephoned cancelling the attack by machine-gun fire on Beveren and Handzaeme aerodromes, adding Moorseele aerodrome.

30/7/17.

(c)

Machines of the Special Duty Flight (9th Wing) will bomb the ammunition depot at Mouscron to-night.

30/7/17.

(d)

In addition to the orders contained in G.S. 21/1, dated 25th and 27th July, for Z day, O.C., 9th Wing, will detail one De Havilland 4 to reconnoitre the line Roulers-Thourout-Bruges-Ghent-Deynze-Courtrai for train and road movements at 4 p.m.

30/7/17.

(e)

Machines of the Special Duty Flight (9th Wing) will bomb the railway station at Mouscron to-night.

31/7/17.

APPENDIX VII

V BRIGADE R.F.C. ORDER NO. 52 FOR 31ST JULY 1917 by
Brigadier-General C. A. H. Longcroft

Commanding V Brigade, Royal Flying Corps.

In the Field. 30th July 1917.

1. *Offensive Patrols.*

Continuous offensive patrols of 4 machines over enemy's balloon line at 8,000'.

Additional offensive patrols will be sent out as the situation demands.

2. *Aerodrome Attack.*

The following aerodromes will be attacked as soon as it is light enough for accurate shooting with machine-gun fire from a low altitude. One machine will be told off to attack each aerodrome—

Lichtervelde-Thourout-Moorseele.

Lichtervelde and Rumbeke aerodromes will, in addition, be bombed from a height 3 times during the day by 8 D.H.4's (4 machines to each aerodrome).

3. *Balloon Attack.*

One squadron will be detailed to carry out the attack on enemy balloons

which must be kept down throughout the day. The Activity Office should communicate direct to squadron concerned.

4. *Ground Targets.*

All favourable enemy targets west of a line Staden-Dadizeele will be attacked from low altitudes. (Not above 2,000'.)

These attacks will be carried out as opportunities occur by machines of Corps squadrons and by scout machines specially detailed for low flying.

Particular care will be taken that no troops are fired at on the ground unless they are unmistakably identified as hostile.

These machines will also be employed in attacking and driving off enemy contact-patrol machines.

5. *Reconnaissances.*

Reinforcements by bus or march route may be expected from the direction of Houthulst-Staden-Westroosebeke-Moorslede-Terhand-and Gheluwe. The roads from these places should be kept under careful observation from dawn by Corps squadrons.

The Officer Commanding 22nd Wing will arrange to keep under supervision from dawn the following railways for signs of reinforcements:

Thourout-Cortemarck-Zarren.

Cortemarck-Staden.

Thourout-Roulers.

Ingelmunster-Roulers.

All normal gauge and light railways in area Courtrai-Menin-Ledeghem.

6. *Wireless Interruption.*

Wireless Interruption will be carried on as usual.

(Sgd.) C. F. GORDON,

Captain,

Brigade Major,

V Brigade, Royal Flying Corps.

Issued at 7.40 p.m.

APPENDIX VIII

9TH WING, R.F.C. ORDER NO. 284

(*Reference Maps Sheets of Belgium and France 1/250,000*
In the Field.)

Tuesday, 31st July 1917.

The following Operations will be carried out to-day.

1. *Attack on Hostile Aerodromes.*

As detailed in 9th Wing letter G. 371 dated 25th July 1917.¹

¹ *Author's Note:* See Appendix VI, para. 3, which also lists the aerodromes.

2. *Attack of Troops, &c., on the Ground.*

East of the line Staden-Dadizeele.

Nos. 56 and 70 Squadrons.

One machine to stand by ready to leave the ground at short notice from 4 a.m.

Further machines will be detailed during the day from all Squadrons for this duty.

3. *Reconnaissance.*

No. 55 Squadron. One De Havilland 4, carrying a wide angle camera, to stand by ready to leave the ground from 3 p.m. and reconnoitre from a height the line Roulers-Thourout-Bruges-Ghent-Deynze-Courtrai.

Information required:

Reports on all train and road movements observed.

Photographs of principal railway sidings, and also of any abnormal road movement. A photograph is also to be taken of 1/40,000 Sheet 13.G.25 and 26.

4. *Bombing.*

No. 27 Squadron. (A) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 4.30 a.m. and bomb from a height Marcke aerodrome.

(B) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 4.30 a.m. and bomb from a height Heule aerodrome.

(C) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 10 a.m. and bomb from a height Heule aerodrome.

(D) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 10 a.m. and bomb from a height Marcke aerodrome.

(E) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 2 p.m. and bomb from a height Heule aerodrome.

(F) 6 Martinsydes, carrying 20-lb. bombs, to leave the ground at 2 p.m. and bomb from a height Marcke aerodrome.

No. 55 Squadron. (A) Two raids of 6 De Havilland 4's, each carrying 20-lb. bombs, to leave the ground at 4.30 a.m. and bomb from a height Ingelmunster aerodrome.

(B) 6 De Havilland 4's, carrying 20-lb. bombs, to leave the ground at 4 p.m. and bomb from a height Ingelmunster aerodrome.

5. *Offensive Patrols.* On the line Comines-Harlebeke.

No. 19 Squadron. (A) 6 S.P.A.D.'s.—4.30 a.m. (In connexion with Martinsyde raids on Marcke and Heule.)

(B) 6 S.P.A.D.'s—8.30 a.m.

(C) 6 S.P.A.D.'s—12.30 p.m.

(D) 6 S.P.A.D.'s—4.30 p.m.

No. 56 Squadron. (A) 6 S.E.5's—6.30 a.m.

(B) 6 S.E.5's—10.30 a.m. (In connexion with Martinsyde raid on Heule.)

(C) 6 S.E.5's—2.30 p.m. (In connexion with Martinsyde raid on Heule.)

(D) 6 S.E.5's—6.30 p.m.

On the line Staden-Ingelmunster.

No. 66 Squadron. (A) 6 Sopwith Scouts—4.30 a.m. (In connexion with two De Havilland raids on Ingelmunster.)

(B) 6 Sopwith Scouts—8.30 a.m.

(C) 6 Sopwith Scouts—12.30 p.m.

(D) 6 Sopwith Scouts—4.30 p.m. (In connexion with De Havilland Raid on Ingelmunster.)

No. 70 Squadron. (A) 6 Sopwith 'Camels'—6.30 a.m.

(B) 6 Sopwith 'Camels'—10.30 a.m. (In connexion with Martinsyde raid on Marcke.)

(C) 6 Sopwith 'Camels'—2.30 p.m. (In connexion with Martinsyde raid on Marcke.)

(D) 6 Sopwith 'Camels'—6.30 p.m.

(Sgd.) R. A. PROUT,
Captain,
Staff Officer,
9th Wing, R.F.C.

Time issued—1.15 a.m.

APPENDIX IX

THE BATTLE OF CAMBRAI, 1917

R.F.C. H.Q. Instructions to I Brigade and Ninth Wing

1. The Third Army is carrying out a surprise attack at a time and date which will be notified to you later. The scope of the attack has already been explained to you by the G.O.C.

2. The operations to be carried out by the 3rd Brigade are shown on the attached map.¹

3. The lines on which the 1st Brigade and 9th Wing will co-operate are given in paras. 4 and 5 hereof. They are designed—

(a) to interfere as much as possible with the arrival of reinforcements by road and rail.

(b) to take immediate advantage of any signs of withdrawal in the area north of the SENSÉE river to increase the confusion.

All information received from the battle area will be passed to 1st Brigade and 9th Wing at once by Advanced H.Q., R.F.C. All information obtained by squadrons of the 1st Brigade and 9th Wing will be telephoned immediately to Advanced H.Q., R.F.C., for transmission to the Third Army and 3rd Brigade.

The G.O.C. wishes the G.O.C., 1st Brigade, and O.C., 9th Wing, to keep a very careful watch on the progress of operations and to act accordingly. Except for bombing, which will be carried out as ordered, both by day and night, irrespective of the enemy's movements, he does not wish large numbers of machines sent out, especially in the early stages, unless the activity of the enemy in the air or on the ground warrants this being done.

¹ *Author's Note:* See map, p. 244.

At the same time, he wishes G.O.C., 1st Brigade, and O.C., 9th Wing, to make every preparation to keep themselves fully informed of the situation and to take instant advantage of any movement, either of reinforcements or in the nature of a withdrawal, to throw the enemy's troops into confusion by a vigorous offensive.

4. The 1st Brigade and 9th Wing will base their operations on Z day on the following plan:

(i) *1st Brigade.*

- (a) D.H.4's will bomb SOMAIN and DECHY railway stations. Unless otherwise ordered, machines will cross the line at 7 a.m.

If the weather is cloudy, as is most probable, these raids will be carried out as continuously as possible throughout the day by machines flying singly or in pairs in and below the clouds.

If fine, the raids will be carried out in formation as often as possible and the G.O.C., 1st Brigade, will detail such offensive patrols as he considers necessary (but see (ii) (b) below).

- (b) If the weather is suitable, offensive patrols will work on the line DOUAI-CAMBRAI, as far south as the SENSÉE river, the first patrol crossing the lines at 7 a.m. A proportion of the machines of these patrols, except the first, should descend for the last 15 minutes of their patrol and attack ground targets north of the SENSÉE as far east as the line SOMAIN-DENAIN.

- (c) If the weather is cloudy, scouts will work in pairs in the above area and attack low-flying hostile machines and ground targets. These machines will be sent out at the discretion of the G.O.C., 1st Brigade, in accordance with the enemy's aerial and ground activity.

Two scouts will be kept on the ground throughout the day ready to attack on orders from Advanced H.Q., R.F.C., any formed bodies of the enemy, information concerning which may be received from sources other than the 1st Brigade.

- (d) 12 R.E.8's or A.W.'s will be held in readiness to supplement the scouts in case of considerable enemy movement by bombing and machine-gun fire. They will be employed at the discretion of the G.O.C., 1st Brigade, or on orders from Advanced H.Q., R.F.C.

- (e) One D.H.4 will reconnoitre the area north of the SENSÉE as far east as DENAIN throughout the day from 10 a.m. onwards for movement on roads and railways.

(ii) *9th Wing.*

- (a) D.H.4's will bomb VALENCIENNES and DENAIN stations.

- (b) Martinsydes will bomb DOUAI and BUSIGNY stations.

Raids (a) and (b) will be carried out as in the case of the 1st Brigade, the first machines crossing the lines at 7 a.m.

Machines bombing BUSIGNY will cross the lines south of BELLICOURT.

If the raids are done in formation, Bristol Fighters will patrol the line DOUAI-DENAIN during the time the raids are out.

- (c) One D.H.4 or Bristol Fighter will reconnoitre the area north of the bridges at MARCOING-MASNIÈRES and east of CAMBRAI as far north as the River SENSÉE from 10 a.m. onwards with a view to following the advance of our Cavalry and reporting any movement of the enemy towards CAMBRAI from the east and north-east.

5. *9th Wing.*

Night Z/Z+1.

(a) Six machines of No. 102 Squadron will bomb DOUAI station.

(b) Six machines of No. 102 Squadron will bomb SOMAIN station.

The above machines will fly to MONT ST. ELOI on Z day and will carry out the raids from there, returning to MONT ST. ELOI or their own aerodrome at the discretion of the O.C., 9th Wing.

O.C., 9th Wing, will arrange matters direct with the G.O.C., 1st Brigade.

6. Zero hour on Z day will not be definitely decided till the previous night. No machines are to cross the lines before zero hour. It may, therefore, be necessary to postpone the start of the bomb raids and patrols. G.O.C., 1st Brigade, and O.C., 9th Wing, will be informed by Advanced H.Q., R.F.C., by telephone should a postponement be necessary.

7. The above orders may be altered or modified by Advanced H.Q., R.F.C., throughout the day in accordance with the development of the operations. G.O.C., 1st Brigade, and O.C., 9th Wing, will arrange that either they themselves or their Staff Officers are present at all times to take telephonic instructions.

8. Nothing in these orders is to be communicated to pilots or observers before dark on Y day.

9. Acknowledge.

P. GAME,
Brigadier-General,
General Staff.

Advanced H.Q., R.F.C.

18th November 1917.

APPENDIX X

ORDER OF BATTLE OF THE ROYAL FLYING CORPS ON 20TH NOVEMBER 1917 (CAMBRAI)

General Officer Commanding: Major-General H. M. Trenchard, C.B.,
D.S.O., A.D.C., St. André-aux-Bois (Advanced H.Q., Fienvillers).

H.Q. Ninth (H.Q.) Wing. Lt.-Col. W. R.

Freeman, D.S.O., M.C. Boisdingham

Squadrons.

22 (Bristol Fighter) Maj. L. W. Lear-

mount, D.S.O., M.C. Liettes

(Estrée Blanche)

H.Q. Ninth (H.Q.) Wing—Squadrons (cont.)

25 (D.H.4) Maj. C. S. Duffus, M.C.	Boisdinghem
27 (Martinsyde Scout and D.H.4) Maj. W. D. Beatty	Serny
101 (F.E.2b) Maj. W. B. Hargrave	Clairmarais
102 (F.E.2b) Maj. H. Wyllie	Treizennes
Special Duty Flight (F.E.2b) Capt. J. W. Woodhouse, D.S.O., M.C.	Clairmarais

Total aeroplanes on charge . . . 93

*H.Q. I Brigade. Brig.-Gen. G. S. Shephard,
D.S.O., M.C.*

Bruay

*H.Q. First (Corps) Wing. Lt.-Col. T. W. C.
Carthew, D.S.O.*

Bruay

Corps. Squadrons.

I 2 (Armstrong Whitworth) Maj.
W. R. Snow, M.C.

Hesdigneul

XI 4 (R.E.8) Maj. L. Jenkins, M.C.

Chocques

XIII* 5 (R.E.8) Maj. E. J. Tyson, D.S.O.,
M.C.

Acq

Canadian 16 (R.E.8) Maj. C. F. A. Portal,
D.S.O., M.C.

Camblain-l'Abbé

Total aeroplanes on charge . . . 72

*H.Q. Tenth (Army) Wing. Lt.-Col. R. B.
Martyn, M.C.*

Bruay

Squadrons.

8 Naval (Sopwith 'Camel') Sqdn.-Cdr. C.
Draper

Mont St. Eloi

18 (D.H.4) Maj. G. R. M. Reid, M.C.

Auchel (Lozinghem)

40 (S.E.5a) Maj. L. A. Tilney

Bruay

43 (Sopwith 'Camel') Maj. A. S. W. Dore

Auchel

Total aeroplanes on charge . . . 68

*H.Q. First Balloon Wing. Lt.-Col. P. K. Wise,
D.S.O.*

Béthune

Companies 1 (Capt. W. Y. Walls, Sections 8 and 20)

2 (Capt. C. M. Down, 10 and 24)

3 (Capt. T. Kennie, 30 and 37)

4 (Maj. J. R. Bedwell, 40, 42, and 46)

First Army Aircraft Park. Maj. G. L.

Wightman . . . Houdain

* 'B' Flight at Moeres under Third (Corps) Wing working with XIX Corps Heavy Artillery under orders of Belgian G.Q.G.

H.Q. II Brigade. Brig.-Gen. J. H. W. Becke,
D.S.O. Oxelaere (Cassel)

H.Q. Second (Corps) Wing. Lt.-Col. C. F. de S.
Murphy, D.S.O., M.C. Mont Rouge

Corps. Squadrons.

II 7 (R.E.8) Maj. B. E. Sutton,
D.S.O., M.C. Proven

XIX 9 (R.E.8) Maj. J. T. Rodwell Proven

II (Anzac) 10 (A.W.) Maj. K. D. P. Murray,
M.C. Abeele

VIII 21 (R.E.8) Maj. L. T. N. Gould,
M.C. La Lovie

IX 53 (R.E.8) Maj. G. Henderson Bailleul

I (Anzac) 69 (R.E.8) Maj. D. V. J. Blake Bailleul

Total aeroplanes on charge 118

H.Q. Eleventh (Army) Wing. Lt.-Col. A. J. L.
Scott, M.C. Mont Rouge

Squadrons.

1 (Nieuport Scout) Maj. A. Barton Adams Bailleul

19 (Spad) Maj. W. D. S. Sanday, D.S.O.,
M.C. Bailleul

20 (Bristol Fighter) Maj. E. H. Johnston St. Marie-Cappel

23 (Spad) Maj. C. E. Bryant, D.S.O. La Lovie

29 (Nieuport Scout) Maj. C. H. Dixon,
M.C. Poperinghe

32 (D.H.5) Maj. J. C. Russell. Droglandt

57 (D.H.4) Maj. C. A. A. Hiatt, M.C. Boisdillinghem

60 (S.E.5a) Maj. W. J. C. Kennedy-
Cochran-Patrick, D.S.O., M.C. St. Marie-Cappel

65 (Sopwith 'Camel') Maj. J. A. Cunning-
ham Bailleul

70 (Sopwith 'Camel') Maj. H. B. R. Grey-
Edwards, M.C. Poperinghe

Total aeroplanes on charge 192

H.Q. Second Balloon Wing. Lt.-Col. W. F.
MacNeece, D.S.O. Mont Rouge

Companies 5 (Capt. F. J. F. Lee, Sections 2 and 25)

6 (Capt. H. P. L. Higman, 16 and 32)

7 (Capt. F. X. Russell, 15 and 38)

8 (Capt. J. A. Cochrane, 23 and 39)

11 (Capt. T. G. G. Bolitho, M.C., 9 and 47)

13 (Maj. G. A. N. Mitchell, 3 and 4)

17 (Capt. F. C. Mears, 13, 18, and 36)

20 (Capt. H. B. T. Hawkins, 22 and 34)

Second Army Aircraft Park. Maj. C. G.

Martyn Hazebrouck

Fifth Army Aircraft Park. Maj. S. J. Payne Herzeele

<i>H.Q. III Brigade.</i>	Brig.-Gen. J. F. A. Higgins,	
	D.S.O.	Albert
<i>H.Q. Twelfth (Corps) Wing.</i>	Lt.-Col. W. G. S.	
	Mitchell, M.C.	Biefvillers-les-Bapaume
<i>Corps.</i>	<i>Squadrons.</i>	
V	*6 (R.E.8) Maj. A. W. H. James,	
	M.C.	Bertangles
VII	8 (A.W.) Maj. E. L. Gossage, M.C.	Mons-en-Chaussée
VI	12 (R.E.8) Maj. J. A. G. De Courcy,	
	M.C.	Courcelles-le-Comte
XVII	13 (R.E.8) Maj. A. G. R. Garrod,	
	M.C.	Etrun
IV	15 (R.E.8) Maj. H. S. Walker	Lechelle
Cavalry	35 (A.W.) Maj. A. V. Holt	Estrées-en-Chaussée
III	59 (R.E.8) Maj. R. Egerton, M.C.	Longavesnes
<i>Total aeroplanes on charge</i>		125

<i>H.Q. Thirteenth (Army) Wing.</i>	Lt.-Col. G. F.	
	Pretyman, D.S.O.	Toutencourt
<i>Squadrons.</i>		
3	(Sopwith 'Camel') Maj. R. Raymond-	
	Barker, M.C.	Warloy
11	(Bristol Fighter) Maj. R. F. S. Morton	Bellevue
41	(S.E.5a) Maj. F. J. Powell, M.C.	Lealvillers
46	(Sopwith 'Pup' and 'Camel') Maj. P.	
	Babington, M.C.	Le Hameau
49	(D.H.4) Maj. B. H. Turner	Bellevue
56	(S.E.5a) Maj. R. Balcombe-Brown,	
	M.C.	Laviéville
64	(D.H.5) Maj. B. E. Smythies	Le Hameau
68	(D.H.5) Maj. W. O. Watt	Baizieux
84	(S.E.5a) Maj. W. S. Douglas, M.C.	Le Hameau
<i>Total aeroplanes on charge</i>		164

<i>H.Q. Third Balloon Wing.</i>	Lt.-Col. F. H.	
	Cleaver, D.S.O.	Biefvillers-les-Bapaume
<i>Companies</i>	10 (Maj. C. H. Stringer, Section 5)	
	12 (Capt. W. S. Huxley, 45)	
	14 (Capt. G. B. Robotham, 11 and 29)	
	15 (Maj. J. H. Davies, 41)	
	18 (Capt. E. B. Cowell, 31)	
	19 (Capt. N. J. A. L. Prinsep, 1, 14, 28, 35, and 44)	
	(19 Section working with Cavalry Corps)	
Third Army Aircraft Park.	Maj. R. Hall	Puchevillers

ORDER OF BATTLE (CAMBRAI)

H.Q. Fourteenth (Army) Wing. Lt.-Col. P. B.

Joubert de la Ferté, D.S.O. . . . Teteghem

Squadrons.

24 (D.H.5) Maj. J. G. Swart, M.C. . . Teteghem

48 (Bristol Fighter) Maj. H. S. Shield,
M.C. Leffrinckhoucke

54 (Sopwith 'Pup') Maj. K. K. Horn . Teteghem

Total aeroplanes on charge . . . 51

H.Q. Third (Corps) Wing. Lt.-Col. A. S.

Barratt, M.C. Zuydcoote

Corps. Squadrons.

XIX 5 (Detached Flight, R.E.8) . . . Moeres

XXXVI 52 (R.E.8) Maj. A. A. Walser, M.C. Bray Dunes
(French)

Total aeroplanes on charge . . . 29

H.Q. Fourth Balloon Wing. Lt.-Col. Hon.

J. D. Boyle, D.S.O. NW. of La Panne

Companies 9 (Capt. G. S. Sansom, M.C., Sections 7 and 33)

16 (Capt. Hon. E. G. W. T. Knollys, 12 and 43)

Fourth Army Aircraft Park. Maj. A. Levick Coudekerque

**H.Q. Forty-First (Bombing) Wing.* Lt.-Col.

C. L. N. Newall Bainville-sur-Madon

Squadrons.

55 (D.H.4) Maj. J. E. A. Baldwin . . . Tantonville

100 (F.E.2b) Maj. M. G. Christie, D.S.O.,
M.C. Ochey

Naval 'A' (Handley Page) Sqdn.-Cdr. K. S.
Savory, D.S.O. Ochey

Total aeroplanes on charge . . . 49

Sixth Army Aircraft Park. Maj. A. F. A.

Hooper Vezelise

No. 1 Aircraft Depot. Lt.-Col. R. H. Collier . St. Omer

No. 1 Aeroplane Supply Depot. Lt.-Col.
C. G. S. Gould St. Omer

No. 2 Aircraft Depot. Lt.-Col. A. Christie . Candas

No. 2 Aeroplane Supply Depot. Lt.-Col.
A. V. Bettington Fienvillers

Engine Repair Shops. Lt.-Col. G. B. Hynes,
D.S.O. Pont de l'Arche, Rouen

R.F.C. Port Depot. Lt. J. S. Done . . . Le Havre

Strength: 52 Squadrons.

1 Special Duty Flight.

961 aeroplanes.

42 K.B. Sections.

* For special bombing of military targets in Germany.

APPENDIX XI

BATTLE OF CAMBRAI

III Brigade Royal Flying Corps. Special Operation Order No. 370.

1. An operation G/Y by the Third Army will take place on Z day at zero hour.

The date of Z day and the hour of zero will be notified later to all concerned.

2. 3rd Brigade, R.F.C., will co-operate as under:

(a) Reconnaissance.

Machines: Bristol Fighters.

Line: Gouy – Serain – Bertry – Solesmes – Haspres – Bouchain – Féchain – Tortequenne – Oisy le Verger – Iwuy – Escaudœuvres – Bourlon.

Information: Any movements by road or rail. Special attention is to be paid to approaches from the north.

Time: This line is to be reconnoitred throughout the day: the first reconnaissance will leave the ground at zero+30 minutes.

If the weather is too bad for formation flying the reconnaissance will be done by machines flying singly or in pairs.

(b) Bombing.

(i) Aerodromes at:

Avesnes le Sec

Awoingt

Carnières

Caudry

Estourmel

Proville

Machines: Sopwith 'Camels', 4 machines to each aerodrome.

Time: As early as possible after zero: no machine will cross our front line before that hour.

General: Objectives will be bombed from a low altitude; any favourable target at these aerodromes will be attacked by machine-gun fire.

Machines will return immediately after the attack.

Photographs of objectives have been issued.

(ii) Head-quarters at Escaudœuvres and Caudry.

Machines: 6 R.E.8's from No. 13 Squadron, and 6 A.W.'s from No. 8 Squadron respectively.

Time: As early as possible after zero: no machine will cross our front line before that hour.

Escort: No close escort: offensive patrols will be working in the vicinity of the objectives.

III BRIGADE ORDER (CAMBRAI)

General: Bombing will be done with 25-lb. bombs from a height. No. 13's machines will cross our line near the Bapaume-Cambrai Road.

The attacks will be repeated at zero+4 hours. Photographs of the objectives have been issued.

(iii) Railway station at Le Cateau.

Machines: 6 D.H.4's.

Time: Machines will leave ground at Z+2 hours.

General: Bombing will be done with 112-lb. bombs from a height. The attack will be repeated as early as possible.

Photographs of objective have been issued.

(c) *Low-flying machines:*

- (i) Three groups of batteries will be attacked with bombs and machine-gun fire.

The groups selected will be notified later.

Machines: 4 D.H.5's, 8 Sopwith 'Camels'.

Time: zero+15 minutes.

- (ii) All available D.H.5's and Sopwith 'Camels' will attack troops, transport, and other targets on the ground with bombs and machine-gun fire from zero+45 minutes onwards.

These attacks will be distributed from Fontaine-les-Croisilles to Bellicourt between the hours of zero+45 minutes and zero+2 hours, with a view to deceiving the enemy as to the main point of attack.

From zero+2 hours onwards machines will be concentrated on the front of the main attack.

Special attention will be given to the lines of approach of resting battalions. The Order of Battle map issued by the Third Army shows those opposite our main attack.

A list of the positions of resting battalions, from north to south, on the front affected, has been issued to 13th Wing.

Arrangements will be made to have 18 machines standing by from zero+4½ hours to assist the advance of the cavalry.

Orders for these machines will be issued by telephone from 3rd Brigade H.Q. as the situation develops.

No targets on our side of the Blue line, on the barrage map issued by the Third Army, is to be attacked.

After Z+1½ hours no target on our side of the Brown line is to be attacked, and after Z+3 hours no target on our side of the line Lock No. 6-Graincourt-Noyelles-sur-l'Escaut-Rumilly-Creveœur-Lesdain-Chencaux Wood-Bantouzelle.

All pilots will know these limits thoroughly.

After Z+4½ no limits can be laid down, but the greatest care must be taken by pilots not to attack our advanced troops.

Four D.H.5's or Sopwith 'Camels' will be always ready to leave the advanced landing-ground to attack low-flying E.A. These

machines can be found from those next due to go out to attack ground targets.

Arrangements will be made for the A.A. look-out post to give warning of such E.A. direct to the advanced landing-ground by priority telephone.

- (d) All S.E.5 machines, except as in para. 3 below, will be used for offensive patrols. Approximately 18 machines will be kept out from zero hour, onwards, throughout the day.

The course that these patrols follow will include the aerodromes mentioned in sub-para. 2 (b) (i) above.

As the situation develops patrols will be pushed farther out.

3. Should the weather be favourable for balloon observation, S.E.5 machines, as necessary, will attack any hostile balloons which are up on the main front of attack.

Arrangements will be made for the A.A. look-out post to warn 13th Wing when hostile balloons ascend.

A list of hostile balloons which are likely to ascend is being issued to A.A. Head-quarters and to the 13th Wing at an early date.

4. Should the weather be too bad for formation flying, machines will work in pairs.

Arrangements have been made for the A.A. look-out post to keep the 13th Wing and the 3rd Brigade informed as to the weather on the front line.

(Sgd.) R. H. JERMAN,
Captain,
Brigade Major,
III Brigade, Royal Flying Corps.

3rd Brigade, H.Q.
 16th November 1917.

APPENDIX XII

EMPLOYMENT OF BATTLE FLIGHTS¹

I. EMPLOYMENT AND DUTIES OF BATTLE FLIGHTS

1. The employment of low-flying aeroplanes on the battle-field and their co-operation in the fighting on the ground, by opening machine-gun fire or attacking with bombs and hand grenades, is particularly effective from the point of view of *moral*, both on our own and the enemy's troops.

2. The systematic participation in the battle of massed flying formations (battle flights) against ground targets is of extreme importance.

In the attack, battle aeroplanes fly ahead of and carry the infantry along with them, keeping down the fire of the enemy's infantry and barrage batteries.

In the defence, the appearance of battle aeroplanes affords visible proof

¹ Translation of a German document, dated 20th of February 1918, issued by the Chief of the General Staff of the Field Army.

to heavily engaged troops that the Higher Command is in close touch with the front, and is employing every possible means to support the fighting troops. Confidence in a successful defence is thereby strengthened.

The object of the *battle flights* is to shatter the enemy's nerve by repeated attacks in close formation and thus to obtain a decisive influence on the course of the fighting.

They cause confusion to a considerable distance behind the enemy's front line, dislocate traffic and inflict appreciable losses on reinforcements hastening up to the battle-field.

3. Formations of *reconnaissance flights* should not be employed for the attack of ground targets, as this would be to the detriment of their special work of reconnaissance and observation.

On the other hand, the contact-patrol machine, which, from the very nature of its duties, is compelled to fly low, will frequently find opportunities to employ its machine-gun against ground targets.

Bombing squadrons are not suitable for low-flying work.

The most important duty of *pursuit flights* is the engagement of the enemy's air forces. Nevertheless, as far as fighting in the air will allow, scouts must also participate in the battle, diving steeply and firing both their machine-guns on the enemy on the ground.

4. *Battle flights* (formerly known as protective flights) are allotted the task of engaging ground targets in close formation. They consist of 6 machines; the commander of a battle flight is an officer.

To obtain more permanent results in offensive operations on a large scale, several battle flights may be grouped to form a *battle-flight group*.

5. The execution of a battle mission makes the fullest demands on the physical capabilities and will-power of a crew. Battle flights must devote themselves exclusively to their particular sphere of action. Tasks forming part of the duties of contact patrol or artillery machines must not be assigned to them simultaneously with their battle duties. On the other hand, battle aeroplanes are responsible for reporting to the proper quarters, immediately after landing, any definite observations made during their flights which may be of value to the Higher Command and to the artillery, e.g. the position of our own or the enemy's infantry in the battle zone.

6. Battle flights should only be employed in *decisive* infantry actions. At other times, they can be employed as escorts to reconnaissance flights working with the infantry and the artillery.

II. COMPOSITION OF BATTLE FLIGHTS AND BATTLE-FLIGHT GROUPS

7. Decisive effect upon the enemy is obtained by the employment of a number of machines in close formation. The *fighting strength of a battle flight* must, therefore, not be less than four machines. The number that can be engaged simultaneously is limited by the possibility of manœuvre under one command. More than six machines are difficult to control.

8. Where several flights are concentrated to form a battle-flight group (three to six battle flights) operating on a single sector of attack (*see* para. 4), they should start from the same aerodrome.

III. EMPLOYMENT OF BATTLE FLIGHTS

A. Attack

9. In the attack, battle flights will be employed in force to destroy the enemy's forward infantry lines and harass his barrage batteries. In the battle flights, the higher command possesses a powerful weapon which should be employed at the *decisive* point of the attack. They are not to be distributed singly over the whole front of attack, but should be concentrated at decisive points. Less important sectors must dispense with the support of battle flights.

10. Accurate *knowledge of the ground* is the first condition for the successful action of battle flights. Above all, the crews must be familiar with their own forward battle zone, so as to avoid the possibility of firing on their own troops. Consequently, an attack upon the enemy's front line should be made by battle flights which have been flying for a considerable time in that particular sector.

11. The decision as to *the moment at which to engage* battle flights is of particular importance. Engaged too soon they draw the enemy's attention to the point of attack; if too late, they become a danger to their own advancing troops. The greatest effect is obtained if the battle flights cross the front line at the same moment that the infantry advances to the attack (*see para. 22*).

Special battle flights should be detailed to attack the enemy's barrage batteries.

12. These battle flights should be placed under the command of *divisions*, to ensure their being engaged at the right moment. The question of a further decentralization (infantry brigade, infantry regiment) depends on how far in advance the division can fix zero hour.

13. The *Corps* will retain a certain number of battle flights at its disposal for employment during the later stages of the battle in breaking up a fresh resistance or warding off counter-attacks. In these attacks, also, they must be engaged at the decisive point.

In order to expedite the issue of orders, it will often be inadvisable to place flights under divisions. In this case, the flight will receive its instructions directly from the *Corps*.

14. Finally, the *Army* requires a certain number of battle flights for harassing traffic in the enemy's back areas. These should operate, subsequent to the attack, against important roads, especially in cuttings, which are used by reinforcements and transport. Columns on the march, horsed transport columns and Staff cars offer remunerative targets. Furthermore, attacks combined with those of bombing squadrons should also be carried out on the enemy's aerodromes, head-quarters, traffic centres, and railway stations.

15. During the enemy's *retreat*, the targets for battle flights will be the main routes of retirement.

Better results are obtained by repeatedly attacking a single main road than by carrying out isolated attacks against a number of roads. The object must be to render retreat along a particular road impossible by day.

B. Defence

16. Although it is possible by careful preparation to employ battle flights in close co-operation with the infantry assault during our own offensive operations, it is difficult in a defensive battle to decide upon the correct time and place for their engagement. For defence, plans must be carefully thought out beforehand and all preparations systematically made for the concentration of a large force of battle flights.

17. If the enemy's preparations indicate that the infantry attack is imminent, the battle flights must be held in constant readiness. Should the assembly position of the enemy's infantry, either in trenches or in shell holes, be located, the determined and relentless employment of the battle flights which have been held in readiness will impede the 'drive' of the enemy's attack, delay the latter, or break it up completely.

18. Should the advance of the enemy's infantry from their trenches come in the nature of a surprise, the infantry battle, which will sway to and fro, will offer practically no opportunity for the co-operation of battle flights. In this case they will be kept in readiness at convenient aerodromes until the local reserves are engaged in counter-attacks, or until an organized counter-attack is made.

For use in such attacks, battle flights will be placed under the orders of either the divisional commander of the battle sector or the commander of the infantry carrying out the counter-attack.

As regards communication between battle flights and infantry, *see* para. 22.

IV. ALLOTMENT OF DUTIES AND TRANSMISSION OF ORDERS

19. The commander of the battle flight or of the battle-flight group receives *detailed orders* from the head-quarters to which he is attached. These will state the following:

Exact position of our own and the enemy's front lines.

Objective and sector of the attack.

Nature of the preparatory phase.

Method of attack.

Zero hour.

Targets specially allotted to the battle flight.

20. It is essential that all battle flights should be *constantly informed* as to the situation; to facilitate this, the aerodromes where the battle flights are held in readiness must be close to Divisional Head-quarters. Direct telephonic communication with the Divisional or Corps Head-quarters from which orders are issued is absolutely necessary. It is particularly important for battle flights operating against forward targets to be thoroughly familiar with our own and the enemy's forward infantry positions. It will be advisable for a wireless station at the aerodrome to take in messages from the contact-patrol machine.

21. Every battle flight will be given *one target* for each flight, for example, the enemy's front line in a definite area or the enemy's barrage batteries. If the position of our own front line is not exactly known, as, for instance,

during rearguard actions, the enemy's batteries and not his infantry will be given as targets.

22. The *time* for crossing our own front line in the case of targets close at hand should, whenever possible, be given by the watch. Watches must accordingly be synchronized. During open warfare or in counter-attacks, if the zero hour for the infantry attack is not ordered by the watch, the timely engagement of battle flights will be arranged for by signals. A machine will fly over the command post of the commander of the attacking troops (regimental or battalion commander) and fire the light signals laid down by Army Head-quarters in order to demand the time at which the assault is to commence.

Should there be no intention to assault within the next hour, the commander of the troops will lay out the signal 'No' (*see* table of visual signals). The machine will then inform its flight by wireless or by dropping a message on the aerodrome.

The battle-flight commander must thenceforth keep in close touch with the situation by repeatedly sending out a fresh machine.

If the assault is to take place in an hour's time or earlier, the signal 'Yes' will be laid out. The battle flight will then start, on receipt of the previously arranged wireless call or light signal, but will on no account cross the line of our own kite balloons. Immediately before the assault, the commander of the troops will give the signal 'We are about to advance' (*see* table of signals). The communication machine will then fly towards its formation and transmit this by light signal.

23. The hour at which the battle flight will attack is to be *made known to the troops in the orders for the attack*. The infantry must be instructed to fire from time to time the light signals laid down by Army Head-quarters for indicating the position of the front line to the contact-patrol machine.

24. In order to avoid confusion, firing of *further light signals* by battle flights over the lines is not permissible.

25. When several battle flights form a *group*, they should not be employed simultaneously in line of flights, but in waves one behind the other.

Each flight will repeat its attack several times and then be followed by the succeeding flight.

The attack will be timed and the targets selected in such a manner that the enemy is continuously threatened at the *decisive* point of the battle-field.

26. The lower battle machines fly, the greater the moral effect. For this reason, descents to 30-50 metres are advocated. In addition, the material effect against the enemy's front line is also increased by flying low. It has been proved that losses from anti-aircraft fire are not increased by flying very low. For the engagement of larger targets (for instance, reserves and batteries) a height of 400-500 metres is more favourable.

V. TRAINING

27. Battle flights must make use of every opportunity to carry out *training behind the front* for their difficult task. The most important features of this training should be attacks in close formation, manœuvre

in single combat, observation of the flight leader and rapid concentration for a new attack. Each individual man must be completely master of his weapon; the machine-gunners must also be familiar with the use of hand grenades and bombs.

Practice over the enemy's lines, so far as the enemy's anti-aircraft defence permits, offers the best opportunities of training in picking up targets quickly.

Example of Method of Establishing Communication between the Troops and the Battle Flight.

<i>Communication Machine.</i>	<i>Troops.</i>	<i>Battle Flight.</i>
Flies over the Battle H.Q. of the commander of the troops, firing the signals laid down by Army Head-quarters.		Has machines in readiness on the aerodrome.

The attack will take place in half an hour.

Sends a wireless message to the flight to start.	Lay out the signal 'Yes'.	Starts and remains behind its own kite balloons.
--	---------------------------	--

The attack has been postponed for two hours.

Fires the agreed signal for the battle flight.	Lay out signal 'No'.	Returns to its aerodrome.
--	----------------------	---------------------------

The attack will take place in 15 minutes.

Once more instructs the flight to start, by wireless.	Lay out signal 'Yes'.	Starts and remains behind its own kite balloons.
---	-----------------------	--

The attack will take place immediately.

Again fires the prearranged signal for the battle flight.	Lay out signal 'We are about to advance'.	Advances to the attack.
---	---	-------------------------

APPENDIX XIII

EXTRACT FROM GERMAN MANUAL 'THE ATTACK IN POSITION WARFARE', DATED 1ST JANUARY 1918. (Signed by Ludendorff)

VI. AIR FORCES

Introductory. The following rules apply to *attacks on a large scale*, for which strong air forces of all types are indispensable; naturally they are also applicable to smaller attacks.

Principles to be observed when reinforcing the front. The appearance of strong air forces (aeroplanes, balloons, and anti-aircraft guns) is for the enemy one of the surest signs of an impending attack. *The activity of the air forces must, therefore, be moderated during preparations.*

It is very difficult to ensure an adequate engagement of aeroplanes whilst still observing the demands of secrecy, as reinforcements cannot be brought up till very late. By frequently exchanging aircraft units, by attaching aviators to the reconnaissance and protective flights already present on the front of attack, and by forming instructional centres behind the front, an attempt must be made to ensure that the flying personnel possesses the necessary knowledge of the country on the front of attack, without premature transference of forces. Flying at the front must be co-ordinated so that, on the one hand, it will be difficult for the enemy to detect reinforcement, and that, on the other, the aviators are given sufficient opportunity for learning the country.

In any case, complete *photographic reconnaissance* with no gaps must be ensured. This is of decisive importance. Next in importance is the necessity of familiarizing artillery, infantry, and battle aviators with the ground. The main reinforcements in pursuit and protective flights can be brought up last.

The distribution among the attacking divisions of reconnaissance flights, and of units detailed for battle flying, must be carried out sufficiently early to enable them to take part, behind the front (as far back as possible), in the practice attacks of their divisions. Practice in mutual co-operation is indispensable.

The bringing up, housing, and work of balloons and of anti-aircraft guns are governed by the same principles.

Measures of security. *Aerodromes constructed beforehand* during quiet periods, with permanent sheds and huts are of great value, as erection of new hangars, &c., shortly before an attack would betray the concentration of aircraft. In newly occupied aerodromes, machines and lorries must not be left outside the sheds. If there is not sufficient accommodation for all the machines, it may be necessary to dismantle some of them. Flights accommodated in hangars may at first erect only a portion of the hangars and must, as far as possible, conceal them from observation.

Method of screening preparations. In no case must an attempt be made to conceal preparations by means of strong *defensive patrols*, as the enemy can break through them, no matter how strong. Small but vigilant

formations of scouts, ready to attack at any opportunity, must be used at high altitudes, and, if necessary, at two levels. They must keep well back and to the flanks of the sector to be protected. The presence of hostile airmen will be pointed out to them by directional rounds from anti-aircraft guns and by large direction signals on the ground.

Sketches and Maps. *Situation sketches* for new aircraft formations and attacking troops must be prepared in large numbers from the latest photographs.

Maps must be prepared showing dropping stations for messages, distribution of fire zones, and areas over which little or no ground observation is possible: in addition, sketch maps are required for contact-patrol reports.

The allotment of wave-lengths and call signs for aeroplanes and wireless stations requires very careful handling, as the enemy will necessarily have his attention attracted at once to an increase in strength by the use of new call signs. If it is impossible to avoid introducing new call signs, they must be allotted to the stations which are least in use, or are more difficult for the enemy to overhear.

Air forces to be held back. Even during artillery registration and after fire for effect has commenced, it is advisable to hold back the air forces, so that the enemy may remain in doubt as to the significance of the attack.

Moment for employing full strength of air forces. Only when the enemy has evidently become aware of the impending attack, shows strong air forces and begins a serious artillery reply, must every effort be made to master the enemy's air forces, especially his balloons, and to increase the effectiveness of our artillery fire by full use of our air observation.

The shorter the period between the engagement of the air forces and the beginning of the attack, the more unexpectedly this is effected and the more these forces are centrally controlled, the greater will be their effect on the course of the attack. The increased activity in the air must then not be confined to the zone of the attack, but must be extended at least as far to the flanks as is the action of the artillery on the ground.

Action against enemy's contact patrols. As soon as our own fire becomes heavy there is generally a considerable increase in the activity of the hostile infantry aeroplanes. It is the duty of the machine-guns and anti-aircraft batteries to beat them off, as a barrage of pursuit machines is impossible at so low an altitude. It is advisable to push anti-aircraft batteries well forward; they should not open fire until the beginning of the attack.

Patrolling the line. During the artillery and trench mortar preparation, small formations of scouts must remain above the lines and prevent every attempt of single machines or small patrols to fly over our front. They must fly at 2 or 3 levels according to the weather. Larger formations, flights, or whole squadrons, must occasionally search for hostile machines on the other side of the lines and bring them down. Care must be taken, however, that our air forces are not used up before the attack begins.

Bombing squadrons must be sent out during the artillery preparation against railway stations, camps, large dumps and aerodromes in turn. During the night and on the morning before the attack, the most important objectives are the enemy's aerodromes. Attacks on trains on open

sections of line—carried out at very low altitudes by daring airmen—may cause a train to derail and thus have important results. Attacks on hostile head-quarters may cause dislocation in the conduct of operations by the destruction of telephone circuits.

Artillery aeroplanes, besides reconnoitring targets, must not be employed solely for the registration of single batteries. They are peculiarly adapted by their mobility and wide field of observation to check periodically during short flights, a whole series of shoots for effect, and to ensure that there are no gaps in the fire. A temporary increase in the rate of fire greatly assists them in this task. This is specially important when dense smoke impairs visibility for other means of observation.

The effect of the fire should be tested during intervals in the firing.

Action immediately before the assault. Our own air activity should in no circumstances conspicuously increase shortly before the assault. It is even better that most of the low-flying machines should turn off to the flanks or rear a few minutes before it takes place.

Only high-flying scouts must remain over the enemy's lines shortly before the assault, in order to keep down the enemy's air observation. It must be arranged by definite orders that nothing in the air shall give a hint of the impending attack.

The moment of the assault is the most critical for the engagement of aircraft units. The machines must not betray the beginning of the assault by their presence, nor must they appear until the enemy's barrage has opened. But, on the other hand, they must take part in the infantry battle with machine-gun fire, hand grenades and bombs, and engage the hostile artillery and air forces.

These results can only be obtained by means of detailed instructions in the orders for the attack as to their activity, and by the *most absolute punctuality* in their engagement in the battle.

Battle formations must attack first; they will be held in readiness on conveniently situated aerodromes or advanced landing-grounds. They must start at the right moment and keep sufficiently far behind the front not to be seen by the enemy but, at the same time, must be able to attack punctually to the minute. In certain circumstances, it is recommended that the time of flight be ascertained by a single machine on the day of the attack itself, as the strength of the wind may upset all calculations.

All protective flights which are available during the infantry battle, and also reconnaissance flights which are not being used for patrolling the battle-field, should be put in as battle flights to engage ground targets. The greater the forces released for this purpose, the greater will be the moral effect produced on the enemy. *Air observation for the artillery and the Higher Command, however, must in no case be allowed to suffer.*

Battle flights should not direct their attacks only on the enemy's front line, they should also seek suitable targets farther to the rear, e.g. hostile batteries still in action, reserves in readiness or advancing, traffic on the roads chiefly used by the enemy for bringing up reinforcements and supplies.

Central control must ensure that, when battle flights are put in,

dispersion of force is avoided, and that the great effect of a number of machines co-operating at points of decisive importance in the battle is fully developed.

Pursuit flights should appear at the same time as battle flights; their duty is, by pushing forward over the line, to destroy the enemy over his own ground and to prevent his reconnaissances from establishing the main direction of our attack.

Strong forces must secure the flanks against envelopment. As the enemy will always attempt to make his attacks and reconnaissances with the sun at his back, the flank next the sun is specially in danger, and the strongest forces, well echeloned in height, should be placed there.

It is desirable to divide the air above the battle-field into several sectors slightly overlapping. In the attack orders each flight or chain should be allotted a fairly wide sector and a particular altitude, which may only be left owing to particular occurrences and for special reasons, except to carry out rapid attacks on hostile formations which must be dealt with outside the areas allotted.

The overlapping portions of sectors should include the vital points of the battle-field, in order that the air forces may be particularly strong there. At heights above 13,000 feet, the use of aircraft in the manner described above only becomes necessary when the front of attack is very wide; forces working at great heights must not be dispersed, as they generally have to engage stronger formations which are endeavouring to penetrate into the back areas.

By adopting this system of allotting sectors, it is possible to avoid the disadvantage of an excess of strength over certain localities with a resultant weakness at others.

The infantry aeroplanes (contact-patrol machines) should appear a few minutes after the commencement of the assault; they should follow the forward movement of the infantry; report any interruptions of its methodical progress, especially noting strong points which remain uncaptured and require a renewed artillery preparation; and call for identification of the front line as soon as the objective is reached. Premature demands for contact-patrol signals are always unsuccessful and make the infantry uneasy; time must be given it to settle in the new positions and overcome the resistance of small hostile detachments. When an infantry aeroplane has observed that the objective ordered has been reached, it should report at once by wireless the points attained. Doubtful points must be reported as such and subsequently cleared up by further reconnaissance. To supplement reports, sketches should subsequently be made and dropped.

In the case of an attack with distant objectives, the front lines must be fixed in the course of the attack during the periods laid down for barrage halts. In no circumstances, however, should the attack be checked for this purpose.

Besides following the advance, the infantry aeroplanes must watch the general activity of the enemy, in order to report counter-attacks and the assembly and pushing forward of reserves, and to ask for artillery fire at the proper time.

Bombing attacks on hostile aerodromes are specially effective during and shortly after the attack, as they considerably dislocate the engagement of the enemy's air forces and may partly prevent it, whereas attacks on camps and ammunition and supply dumps are of less importance at the moment. On the other hand, bombing and machine-gun attacks on batteries in action or against reserves may seriously hinder the enemy's action.

Action of artillery aeroplanes after the assault. Only the artillery aeroplanes remain continuously over the battle-field before, during, and after the assault.

Their action in the battle is concerned less with obtaining a large number of observations at the moment of the assault than with the *uninterrupted watching of our own and the enemy's activity during the whole battle, and with rapid and timely reporting to our batteries concerned.* It is of the greatest importance to report the hostile batteries which are most active, batteries successfully engaged, well and badly directed fire, good targets which are not fired on, &c. The artillery aeroplanes must be given definite orders for such observation, which they must carry out in addition to general supervision of the battle-field. They must know exactly what orders have been given to their own artillery, so that they may suit their action to the course of the battle. Their work will only be successful if they have been thoroughly instructed.

Balloons. The work of the artillery airman will be supplemented by the use of balloons which, if sent forward early, will furnish exceptionally valuable reports to the commander of the troops and to the artillery. They may be sent forward immediately before or after the first attack with comparatively little danger, as the hostile artillery will be kept engaged in other tasks.

Action of battle and pursuit flights after the assault. After the assault, battle flights must be in readiness for action again as soon as possible, so that they can be used against counter-attacks.

Renewed attacks on balloons may be useful.

As regards the further employment of pursuit flights, it must be remembered that the enemy will not know the time of the assault and, therefore, will not at first have a strong force of aircraft over the battle-field. On the other hand, as soon as the assault commences, he will send up all his available strength, in order to gain supremacy in the air. A considerable increase in the enemy's strength will, therefore, have to be reckoned with during the period extending from $\frac{1}{2}$ hour to $1\frac{1}{2}$ hours after the assault. Fresh pursuit flights must therefore be put in about $\frac{3}{4}$ of an hour after the attack, so that the attacker may also have his greatest strength in aircraft engaged at this time.

Action in a break-through battle. If the attack develops into a break-through battle and the artillery advances, the same tasks fall to the various aircraft formations in the advance and on the new battle-field as are laid down above. The order for them to move forward must be given at the right time.

APPENDIX XIV

THE EMPLOYMENT OF THE ROYAL FLYING CORPS IN DEFENCE

[Memorandum issued by G.H.Q., January 1918]

1. The first and most important of the duties of the Royal Flying Corps in connexion with defence is to watch for symptoms of attack and to use the utmost endeavours to obtain and transmit at once all information which may assist responsible Commanders to determine beforehand when and where an attack is coming and by what force.

It is the duty of the Intelligence Branch of the General Staff to keep the Royal Flying Corps constantly instructed as to the information which is required, and of the suspected areas of hostile concentration.

Every detail observed should be reported. Points of apparent unimportance to an observer are often of great value in elucidating reports from other sources.

It is necessary to the Higher Commands to receive such information of the situation along the whole line of defence as will enable the Commander to determine where a real attack may be expected, from what parts of the front troops may be withdrawn without risk, and where feints or minor attacks are likely to be made.

It is seldom safe to draw conclusions from observations made in any one locality. Observers, therefore, should, as a rule, merely record as fully and accurately as possible what they have seen. It is for the Higher Commanders to draw deductions from the mass of evidence available from the whole front, and from the various sources of information at their disposal.

2. In order that early information of preparations for an attack may be obtained, the Royal Flying Corps will keep the whole of the enemy's possible concentration areas under frequent observation. The indications to be looked for are as follows, stated in order of importance.

The construction of:

- (a) Railways and sidings.
- (b) Roads.
- (c) Dumps.
- (d) Aerodromes.
- (e) Camps.
- (f) Gun positions.

Photographs of the enemy's possible concentration areas should also be taken at such frequent intervals as will ensure that the progress of any preparations may be followed.

The Squadron belonging to the G.H.Q. Wing will be used for reconnaissance beyond the Army Areas.

3. As soon as it has been established that preparations for an attack are in progress behind the enemy's line, the next duty of the Royal Flying Corps is to interfere with them. The means available are:

- (a) Co-operation with our artillery, the activity of which will probably be increased at this stage.

- (b) Extensive bombing attacks, to hinder the enemy's preparations, inflict casualties upon his troops and disturb their rest.
- (c) An energetic offensive against the enemy's aviation in order to permit of (a) and (b).

Information will also continue to be of vital importance to all Commanders.

4. The next step will be the commencement of the enemy's artillery preparation, though in the case of a surprise attack the opening of violent artillery fire may be coincident with the infantry advance, especially if tanks are employed. Whether the period of the preliminary bombardment lasts for days or only for a few hours, the artillery of the defence must endeavour to keep down the fire of the enemy's batteries, to hinder his preparations and to destroy his infantry and their places of assembly. At the moment of assault every gun must be devoted to the annihilation of the enemy's attacking troops and any tanks that may appear.

At this stage the primary duty of the Royal Flying Corps will be to render our artillery fire effective. If this object can be attained, it will be the most material help which can be rendered to the infantry although it may be invisible to them.

So far as may be possible after providing fully for the above primary duty, the Royal Flying Corps will endeavour to prevent the enemy from pressing home the full weight of his attack. The means to be employed stated in their relative order of importance are:

- (a) Attacking the enemy's reinforcements a mile or two behind the assaulting line with low-flying aeroplanes.
- (b) Attacking the enemy's detraining and debussing points, transport on roads, artillery positions and reserves.
- (c) Sending low-flying machines, on account of their moral effect, to co-operate with the infantry in attacking the enemy's most advanced troops.

Every effort to gain and report information of our own troops, as well as those of the enemy, must also be made by the Royal Flying Corps during this phase of the battle, in order that the Higher Commanders may be kept constantly informed of the situation.

5. The next stage will be the counter-attack. In the case of an immediate counter-attack it will be impossible, owing to lack of time, to co-ordinate the infantry attack with that of any low-flying aeroplanes. Provided, however, it is possible to know exactly where the enemy is, and where the counter-attack is to take place, every effort will be made to dispatch a flight of low-flying aeroplanes to assist the infantry by attacking the enemy's troops with machine-gun fire.

In the case of a deliberate counter-attack, which takes the form of a carefully prepared attack, the same principles of co-operation between the Royal Flying Corps and other Arms will be followed as have been employed throughout the offensive operations of the past year.

During this stage, as at all times throughout the battle, information continues to be of vital importance and must be provided for.

6. During all the stages dealt with above, it lies with Army Commanders

to instruct the Royal Flying Corps as to their requirements from day to day.

7. It may become necessary at any time to reinforce the Royal Flying Corps on a threatened front in order that our superiority in the air may be maintained. Schemes for the necessary re-allotment of Royal Flying Corps units to meet the situation will be drawn up by G.O.C., R.F.C., in order that it may be possible to reinforce the R.F.C. Brigade of any Army which may be suddenly called upon to meet an attack. A reserve of four fighting squadrons will be formed from new squadrons as they come out from England, and will be placed temporarily under the G.H.Q. Wing.

8. The successful performance of the role of the Royal Flying Corps in defence, as outlined above, must primarily depend on its ability to gain and maintain the ascendancy in the air. This can only be done by attacking and defeating the enemy's air forces. The action of the Royal Flying Corps must, therefore, always remain essentially offensive, even when the Army, during a period of preparation for offensive operations, is standing temporarily on the defensive.

16th January 1918.

APPENDIX XV

ORDER OF BATTLE OF THE ROYAL FLYING CORPS ON 21ST MARCH 1918 (GERMAN OFFENSIVE)

General Officer Commanding: Major-General J. M. Salmond, C.M.G.,
D.S.O., St. André-aux-Bois.

No. 6 Squadron (R.E.8) Maj. A. W. H. James, M.C. (Special Duty)	Bertangles
--	------------

No. 42 Squadron (R.E.8) Maj. R. G. Gould, M.C.	Fienvillers
---	-------------

(Arrived from Italy 18.3.18 and posted to
I Brigade 22.3.18.)

<i>Total aeroplanes on charge</i>	33
-----------------------------------	----

<i>H.Q. IX (H.Q.) Brigade.</i> Brig.-Gen. R. E. T. Hogg, C.I.E.	Upen-d'Aval
--	-------------

<i>H.Q. Fifty-Fourth (Night) Wing.</i> Lt.-Col. R. G. D. Small	Upen-d'Aval
---	-------------

Squadrons.

58 (F.E.2b) Maj. J. H. S. Tyssen, M.C.	Clairmarais
83 (F.E.2b) Maj. E. L. M. L. Gower	Auchel (Lozingshem)

Special Duty Flight (B.E.12) Capt. L. G. S. Payne (Attd. No. 83 Squadron)	Auchel
--	--------

<i>Total aeroplanes on charge</i>	40
-----------------------------------	----

H.Q. Ninth (Day) Wing. Lt.-Col. W. R. Freeman, D.S.O., M.C. Beaucourt-en-Santerre
Squadrons.

25 (D.H.4) Maj. C. S. Duffus, M.C. . . Villers-Bretonneux
 27 (D.H.4) Maj. G. D. Hill . . . Villers-Bretonneux
 62 (Bristol Fighter) Maj. F. W. Smith . Cachy
 73 (Sopwith 'Camel') Maj. T. O'B. Hubbard, M.C. Champien
 79 (Sopwith 'Dolphin') Maj. M. W. Noel . Champien
 80 (Sopwith 'Camel') Maj. V. D. Bell . Champien
Total aeroplanes on charge . . . 114

H.Q. I Brigade. Brig.-Gen. D. le G. Pitcher, C.M.G. Château Tenby

H.Q. First (Corps) Wing. Lt.-Col. E. L. Gossage, M.C. Bruay

Corps. Squadrons.

I 2 (Armstrong Whitworth) Maj. W. R. Snow, D.S.O., M.C. . . . Hesdigneul
 XV 4 (R.E.8) Maj. R. E. Saul . . . Chocques
 XI 4 (A) (R.E.8) Capt. B. P. B. Carter . Chocques
 XIII 5 (R.E.8) Maj. C. H. Gardner . Acq
 Canadian 16 (R.E.8 and 2 Bristol Fighters) Maj. C. F. A. Portal, D.S.O., M.C. Camblain-l'Abbé
Total aeroplanes on charge . . . 98

H.Q. Tenth (Army) Wing. Lt.-Col. C. T. Maclean, M.C. Bruay

Squadrons.

2 A.F.C. (S.E.5a) Maj. W. Sheldon . Savy
 3 Naval (Sopwith 'Camel') Sqdn.-Cdr. R. Collishaw, D.S.O., D.S.C. . . . Mont St. Eloi
 4 A.F.C. (Sopwith 'Camel') Maj. W. A. McClaughry, M.C. . . . Bruay
 18 (D.H.4) Maj. G. R. Howard, D.S.O. . Treizennes
 22 (Bristol Fighter) Maj. J. A. McKelvie . Serny
 40 (S.E.5a) Maj. R. S. Dallas, D.S.C. . Bruay
 43 (Sopwith 'Camel') Maj. C. C. Miles, M.C. La Gorgue
Total aeroplanes on charge . . . 141

H.Q. First Balloon Wing. Lt.-Col. P. K. Wise, D.S.O. Béthune

Companies 1 (Capt. W. Y. Walls, Sections 8 and 20)
 2 (Capt. C. M. Down, 10 and 24)
 3 (Capt. T. Kennie, 30 and 37)
 4 (Maj. J. R. Bedwell, M.C., 40, 42, and 46)

First Aircraft Park. Maj. G. L. Wightman . Houdain

448 ORDER OF BATTLE (MARCH 1918)

H.Q. II Brigade. Brig.-Gen. J. H. W. Becke,
D.S.O. Oxelaere (Cassel)

H.Q. Second (Corps) Wing. Maj. D. V. J.
Blake (Acting) Mont Rouge

Corps. Squadrons.

Australian 3 A.F.C. (R.E.8) Capt. R. S. Brown
(Acting) Bailleul

II 7 (R.E.8) Maj. B. E. Sutton,
D.S.O., M.C. Proven

II 9 (R.E.8) Maj. J. T. Rodwell Proven

XXII 10 (A.W. and 2 Bristol Fighters)
Maj. K. D. P. Murray, M.C. Abeele

VIII 21 (R.E.8) Maj. L. T. N. Gould,
M.C. La Lovie

Total aeroplanes on charge 98

H.Q. Eleventh (Army) Wing. Lt.-Col. H. A.
Van Ryneveld, M.C. Mont Rouge

Squadrons.

I (S.E.5a and I Nieuport Scout) Maj.
A. Barton Adams Bailleul

19 (Sopwith 'Dolphin') Maj. E. R.
Pretymann Bailleul

20 (Bristol Fighter) Maj. E. H. Johnston St. Marie-Cappel

29 (Nieuport Scout and I S.E.5a) Maj.
C. H. Dixon, M.C. La Lovie

32 (S.E.5a) Maj. J. C. Russell Bailleul

57 (D.H.4) Maj. C. A. A. Hiatt, M.C. St. Marie-Cappel

60 (S.E.5a) Maj. B. F. Moore Bailleul

65 (Sopwith 'Camel') Maj. J. A. Cunning-
ham Droghlandt

Total aeroplanes on charge 153

H.Q. Second Balloon Wing. Lt.-Col. H. M.
Meyler, M.C. Mont Rouge

Companies 5 (Capt. H. A. Laycock, Sections 2, 25, and 36)

6 (Capt. W. F. N. Forrest, 16 and 32)

7 (Capt. F. X. Russell, 38 and 39)

8 (Capt. J. A. Cochrane, M.C., 13 and 23)

11 (Capt. T. G. G. Bolitho, M.C., 47)

17 (Capt. W. G. Dreschfeld, 9, 15, and 18)

Second Aircraft Park. Maj. C. G. Martyn Eecke

Fifth Aircraft Park. Maj. S. J. Payne Herzeele

H.Q. III Brigade. Brig.-Gen. J. F. A. Higgins,
D.S.O. Albert

H.Q. Twelfth (Corps) Wing. Lt.-Col. W. G. S.
Mitchell, D.S.O., M.C. Biefvillers-les-Bapaume

H.Q. Twelfth (Corps) Wing—(cont.)

Corps. Squadrons.

VI	12	(R.E.8 and 1 Bristol Fighter)	
		Maj. J. A. G. De Courcy,	
		M.C.	Boiry St. Martin
XVII	13	(R.E.8) Maj. A. G. R. Garrod,	
		M.C.	Etrun
V	15	(R.E.8 and 1 Bristol Fighter)	
		Maj. H. V. Stammers	Lechelle
IV	59	(R.E.8) Maj. C. J. Mackay, M.C.	Courcelles-le-Comte
		<i>Total aeroplanes on charge</i>	78

H.Q. Thirteenth (Army) Wing. Lt.-Col.

P. H. L. Playfair, M.C. Toutencourt

Squadrons.

3	(Sopwith 'Camel')	Maj. R. Raymond-Barker, M.C.	Warloy
11	(Bristol Fighter)	Maj. R. F. S. Morton	Bellevue
41	(S.E.5a)	Maj. G. H. Bowman, M.C. . .	Lealvillers
46	(Sopwith 'Camel')	Maj. R. H. S. Mealing	Le Hameau
49	(D.H.4)	Maj. J. R. Gould	Bellevue
56	(S.E.5a and 1 R.E.8)	Maj. R. Balcombe-Brown, M.C.	Baizieux
64	(S.E.5a)	Maj. B. E. Smythies	Le Hameau
70	(Sopwith 'Camel')	Maj. H. B. R. Grey-Edwards, M.C.	Marieux
102	(F.E.2b)	Maj. F. C. Baker	Le Hameau
		<i>Total aeroplanes on charge</i>	183

H.Q. Third Balloon Wing. Lt.-Col. F. H.

Cleaver, D.S.O. Biefvillers-les-Bapaume

Companies 10 (Maj. W. S. Huxley, M.C., Sections 5 and 28)

12 (Capt. J. P. Nickalls, 35 and 45)

18 (Capt. E. B. Cowell, 1 and 31)

19 (Capt. P. S. Kershaw, 11 and 44)

Third Aircraft Park. Maj. R. Hall Puchevillers

H.Q. V Brigade. Brig.-Gen. L. E. O. Charlton,

C.M.G., D.S.O. Mesnil St. Nicaise

H.Q. Fifteenth (Corps) Wing. Lt.-Col. I. A. E.

Edwards Villers-Carbonnel

Corps. Squadrons.

VII	8	(A.W.) Maj. T. L. Leigh-Mallory	Templeux-la-Fosse
XIX	35	(A.W. and 2 Bristol Fighters)	
		Maj. A. V. Holt	Estrées-en-Chaussée
XVIII	52	(R.E.8) Maj. A. M. Morison . .	Bonneuil (Golancourt)
IX	53	(R.E.8) Maj. G. Henderson . .	Villeselve
III	82	(A.W.) Maj. A. H. Jackson . .	Bonneuil (Golancourt)
		<i>Total aeroplanes on charge</i>	102

450 ORDER OF BATTLE (MARCH 1918)

H.Q. Twenty-Second (Army) Wing. Lt.-Col.

F. V. Holt, D.S.O. Flez

Squadrons.

5 Naval (D.H.4) Sqdn.-Cdr. S. J. Goble,
D.S.O., D.S.C. Mons-en-Chaussée

23 (Spad) Maj. C. E. Bryant, D.S.O. . Matigny

24 (S.E.5) Maj. V. A. H. Robeson, M.C. . Matigny

48 (Bristol Fighter) Maj. H. S. Shield,
M.C. Flez

54 (Sopwith 'Camel') Maj. R. S. Maxwell,
M.C. Flez

84 (S.E.5a) Maj. W. S. Douglas, M.C. . Flez

101 (F.E.2b) Maj. W. B. Hargrave . Catigny

Total aeroplanes on charge . . . 141

H.Q. Fifth Balloon Wing. Lt.-Col. Hon. A. S.

Byng, D.S.O. Offoy

Companies 13 (Maj. G. A. N. Mitchell, Sections 3, 4, and 29)

14 (Capt. G. B. Robotham, 14 and 19)

15 (Capt. H. A. Page, 21 and 41)

16 (Capt. Hon. E. G. W. T. Knollys, 12 and 43)

20 (Capt. H. B. T. Hawkins, 22 and 34)

Fifty-First Wing (H.Q. only) and Fourth Balloon Wing (H.Q. only) arrived from Italy and attached, supernumerary, to V Brigade, in case of necessity, at Noyon.

Fourth Aircraft Park. Maj. F. Jolly . . Villers Carbonnel

**H.Q. VIII Brigade.* Brig.-Gen. C. L. N.

Newall Château de Froville,
near Bayon

H.Q. Forty-First Wing. Lt.-Col. J. E. A.

Baldwin Bainville-sur-Madon

Squadrons.

55 (D.H.4) Maj. A. Gray, M.C. . . Tantonville

100 (F.E.2b) Maj. W. J. Tempest, D.S.O.,
M.C. Ochey

16 (Naval) (Handley Page and F.E.2b)
Sqdn.-Cdr. H. A. Buss, D.S.C. . Ochey

Total aeroplanes on charge . . . 51

Sixth Aircraft Park. Capt. T. G. Gordon

(Acting) Vezelise

No. 3 Aircraft Depot } Capt. F. M. Courban

No. 3 Aeroplane Supply Depot } Iredale .

No. 1 Aircraft Depot. Lt.-Col. S. E. Smith . St. Omer

No. 1 Aeroplane Supply Depot. Lt.-Col.
C. G. S. Gould St. Omer

* For special bombing of military targets in Germany.

ORDER OF BATTLE (MARCH 1918) 451

No. 2 Aircraft Depot.	Lt.-Col. A. Christie,	
D.S.O.	. . . . .	Candas
No. 2 Aeroplane Supply Depot.	Lt.-Col.	
A. V. Bettington	. . . . .	Fienvillers
Engine Repair Shops.	Col. G. B. Hynes,	
D.S.O.	. . . . .	Pont de l'Arche, Rouen
<i>Total Strength.</i>	63 Squadrons.	
	1 Special Duty Flight.	
	1,232 Aeroplanes.	
	41 K.B. Sections.	

APPENDIX XVI (cont.)

TABLE 'B'. GERMAN AIR STRENGTH OPPOSING THE FRENCH*
(Numbers of serviceable aeroplanes in brackets)

Formation.	Reconnaissance Flights.		Reinforced Artillery Flights.		Fighter Flights.		Bombing Flights.		Total.		
	21.3.18	31.3.18	21.3.18	31.3.18	21.3.18	31.3.18	21.3.18	31.3.18	Flights.	Serviceable Aeroplanes.	
										21	31
7th Army . . .	5 (20)	6 (24)	4 (24)	4 (24)	4 (37)	8 (75)	3 (12)	3 (12)	16	21	93
1st Army . . .	5 (20)	3 (12)	..	..	2 (19)	..	..	..	7	3	39
3rd Army . . .	7 (28)	6 (24)	..	..	3 (28)	1 (9)	..	..	10	7	56
5th Army . . .	11 (44)	6 (24)	..	..	4 (37)	1 (9)	..	..	15	7	81
Army Detmt. 'C' . . .	3 (12)	3 (12)	..	..	2 (19)	1 (9)	..	..	5	5	31
19th Army . . .	4 (16)	4 (16)	..	..	2 (19)	2 (19)	3 (12)	..	9	6	47
Army Detmt. 'A' . . .	†6 (21)	†6 (21)	..	..	3 (28)	2 (19)	..	..	9	8	49
Army Detmt. 'B' . . .	7 (28)	6 (24)	..	..	5 (47)	3 (28)	..	..	12	9	75
Grand Total . . .	48 (189)	40 (157)	4 (24)	5 (30)	25 (234)	18 (168)	6 (24)	3 (12)	83	66	471
											367

* No detailed figures for the French air service are available.

† Includes 1 Serio-photographic Section (3 aeroplanes) and 1 Air Survey Section (2 aeroplanes).

APPENDIX XVI.

COMPARATIVE TABLE OF CHANGES IN STRENGTH OF BRITISH AND GERMAN AIR SERVICES DURING THE GERMAN SOMME OFFENSIVE 1918.

TABLE 'A', BRITISH AND OPPOSING GERMAN.

BRITISH

Numbers of serviceable aeroplanes in brackets.

21ST MARCH 1918.

31ST MARCH 1918.

5TH APRIL 1918.

Formation.

S.S.F.

F.R.

D.B.

S.N.B.

L.N.B.

C.R.

S.D. Flt.

Sqdns.

On Charge.

Serviceable.

S.S.F.

F.R.

D.B.

S.N.B.

L.N.B.

C.R.

S.D. Flt.

Sqdns.

On Charge.

Serviceable.

S.S.F.

F.R.

D.B.

S.N.B.

L.N.B.

C.R.

S.D. Flt.

Sqdns.

On Charge.

Serviceable.

Totals.

APPENDIX XVII

DEVELOPMENT OF AERIAL FIGHTING

(H.Q. R.F.C. Memorandum of December 1917)

The great changes that have taken place since the beginning of the war in aerial fighting make a study of what further progress is likely to be made during the next twelve months of great importance.

Before considering this it would be of value to review the different phases through which aerial warfare has gone up to the present with a view to seeing what further developments may be expected.

In August 1914 the four original squadrons that landed in France were composed of twelve machines each, armed with rifles and revolvers, a machine being detailed for any of the following duties: reconnaissance, artillery work or fighting, no machine specializing in any one role.

Machines worked independently and were able to carry out their work without an escort, as the enemy was using his machines in the same manner.

Up to the end of 1914 no great advance was made; one or two machines appeared fitted with a Lewis Gun on a mounting generally designed by the observer to suit himself.

Early in 1915 the enemy commenced carrying out reconnaissance work and bombing behind our lines with single machines, which necessitated scouts being employed to attack them. Here, for the first time, are machines seen used solely for fighting.

During the spring of 1915 further developments took place, it being found necessary to differentiate between the duties of machines by detailing some permanently for artillery work, some for long distance reconnaissance, and some for fighting. The practice, however, of sending out machines singly without an escort still remained in force.

It was at this time that the first sign of offensive tactics by us appeared, single machines being sent over the enemy's lines with the definite object of seeking out and fighting any hostile machines encountered.

During the summer of 1915 the practice of employing different machines for different duties continued, but owing to the momentary success of the Fokker attacking our machines when working independently, it was found necessary to make the fighting machines work in conjunction with the reconnaissance machines, or in other words to send an escort of a fighting machine whose sole duty it was to keep hostile machines away from the reconnaissance or artillery machine.

A little later an escort of one machine was proved to be insufficient, so two were detailed; the fighting scout also found that more than one machine working together had a better chance of bringing a combat to a decisive end and they, in their turn, commenced working in pairs.

After a short period it was discovered that by using signals, machines working in pairs could effectively work together and this led to the employment of three or four machines in formation, with successful results.

Thus at the beginning of 1916 formation flying, which brought about one of the most drastic changes in aerial fighting, crept in. By this time

single-seater squadrons were formed, as owing to the speed, rate of climb, and facility of manœuvre, the scout proved itself more suitable for offensive action than the two-seater.

Until the summer of 1917 formation flying consisted of from three to six fighting machines working independently on the same front, and it is obvious to any one looking into the near future that the next development will be the co-operation of these formations with each other.

It is certain that until telephonic communication between machines is perfected the number of machines in formation commanded by one man must be kept down to a maximum of six, and it is probable that, even when telephonic communication develops, the greatest number of machines commanded by one man will still remain the same. By this it is not meant that formations will not be able to work together; on the contrary it is certain that this is the next problem to be solved.

In the infantry a force advancing consists of a main body with advanced, rear, and flank guards. In the air the third dimension makes flank and rear-guards unnecessary, the 'above guard' being able to perform the duties of both.

This is undoubtedly best carried out by placing the rearmost formation slightly above the main body, either directly behind or echeloned to a flank. The main body consisting of one or more formations will carry out the offensive fighting, the 'above guard' remaining intact to protect them from surprise attacks.

When a force in open warfare is carrying out an offensive action the troops of the main body must feel that they will not be surprised from the flanks or rear; similarly, the pilots in the main body must feel secure against surprise attacks from above.

The following purely paper scheme is suggested, not to lay down the law, but to open up a train of thought in the right direction:

Suppose a formation consisting of three sub-formations, each consisting of six machines under the command of a Flight Commander, the whole commanded by a Squadron Commander. It must be noted that this suggestion cannot be carried out until squadrons are increased to 24 machines so as to allow for those under repair.

'A' Flight might be ordered to fly across the lines at from 12,000 to 14,000 feet, 'B' Flight flying 2,000 feet above this and 800 to 1,000 yards behind, while the 'above guard', consisting of 'C' Flight, would fly at a height of 18,000 feet and directly in the rear, or in rear and slightly to a flank, of 'B' Flight.

At once the question arises—with which sub-formation is the Commander to fly? Without doubt with the 'above guard', for from there the Squadron Commander can watch the progress of the fight and keep his reserve or 'above guard' in hand.

The action to be taken by the various sub-formations under different circumstances would be as follows:

If 'A' Flight encounters any number of machines up to four, they would attack them and should succeed in driving down or dispersing them, 'B' and 'C' Flights taking no part in the fight.

If 'A' Flight is attacked by superior numbers, or encounters 10 or 12 hostile machines, the second Flight would join in the combat by diving down—thus they must keep a sufficient height above 'A' Flight to enable them to overtake the leading Flight by diving. At the end of a fight, if successful, the sub-formation would rejoin formation in their respective places. If, however, the two Flights cannot drive away the hostile formation, a portion of the rearguard would have to go down to their assistance, but two machines must be left above. However much height the two leading sub-formations lose, the four reinforcing machines should never go right down, though they might go to 6,000 or 8,000 feet, the remaining two keeping a good height unless the German machines come between them and the other four.

If the pilots of 'A' and 'B' Flights had the slightest doubt as to the 'above guard' not being above them, their confidence would be shaken and their fighting value halved.

Again, a superior formation of hostile machines might leave 'A' Flight above and attack 'B' Flight. In this case 'above guard' would not go to its assistance, but 'B' Flight would reinforce itself by diving in front of and underneath 'A' Flight.

Formations consisting of three sub-formations have been discussed, but is that all that may be expected? When the number of squadrons increases it is certain that squadrons will be found co-operating with each other, forming a force consisting of two or three sub-formations. Until telephonic communication is perfected these formations would have definite orders beforehand as to their route and the landmarks over which pre-arranged wheeling would be done.

Of course, in addition to the above formations, sub-formations of six machines working independently would be necessary for patrolling and attacking the enemy within four to eight miles of the lines, in order to destroy isolated enemy machines.

If large formations as above were sent out to-morrow the suggested organization would prove of little value and all combats would develop into 'dog fights', but it is certain that large formations will come and the side which thinks furthest ahead, worries out the details, and puts them into practice will have a very big advantage over the other.

From what I have heard of the success of one particular squadron (which has not been very long in this country) in formation flying of 18 machines after continuous practice, I am confident that if once Squadron Commanders take the matter up under the guidance of the Wing and Brigade Commanders we shall be the side that has this advantage.

My point in bringing up this question is not to lay down definite drill but to impress upon all the principles on which formation fighting should be practised.

The following points require thinking out:

- (1) In what formation are the machines of the sub-formation to fly?
- (2) How many sub-formations should a formation consist of?
- (3) In what formation is the formation to fly?
- (4) With what sub-formation is the Commander to fly?

- (5) What are the duties of the various sub-formations, especially the 'above guard'?
- (6) The co-operation of different types of machines in the same formation.
- (7) The co-operation between different formations.

(Sgd.) H. TRENCHARD,
Major-General,
Commanding, Royal Flying Corps,
In the Field.

H.Q., R.F.C.,
In the Field.
18th December 1917.

APPENDIX XVIII

ORDERS OF GENERAL FOCH (translated)

Secret.
Q.G. 1st April 1918.

General Foch,
État-Major,
No. 33.

General Foch,
to the Field-Marshal Commanding-
in-Chief, British Forces in France.

With a view to ensuring the co-operation of the British and French Air Services during the battle, I have had the accompanying instructions [*directives*] drawn up, and have already sent a copy to General Fayolle.

If you approve of these instructions, I should be obliged if you would issue appropriate orders to the British Air Service so that effect may be given to them and the necessary understanding be reached with the Air Command of the G.A.R. [Group of Reserve Armies].

(Sgd.) FOCH.

Secret.
Q.G. 1st April 1918.

General Foch,
État-Major,
No. 32.

DIRECTIVES

With the Object of Assuring Co-operation between the British and French Air Services

I. Information.

Reconnaissances to ascertain the direction of the enemy's main movements, and therefore his intentions, should extend at least as far as the line ST. QUENTIN-CAMBRAI-DOUAI, where he may detain.

Consequently:

- (a) The French Air Service has been instructed to watch particularly the general direction of movement on the following lines:

RIBEMONT	{	LA FÈRE-CHAUNY
		ST. QUENTIN
ST. QUENTIN	{	JUSSY
		ST. SIMON
		HAM
		PÉRONNE

LE CATELET-PÉRONNE

Reconnaissance of the above is the concern of the Air Service of the G.A.R.—that to the *West* of the line CROZAT CANAL-HAM-CHAULNES-BRAY-SUR-SOMME being the duty of the Air Commands of Armies.

- (b) To ensure that air observation covers *every part of the area of approach to the battle zone*, it will be necessary for the British Air Service to watch particularly the approach routes leading,

from LE CATELET	to PÉRONNE
„ CAMBRAI	„ BAPAUME
„ AUBIGNY	„ ARRAS
„ DOUAI	„ LENS

The air units with Armies will undertake to follow up any movements, discovered in the back areas, as far as the battle front.

2. Bombing.

The *essential* condition of success is the concentration of *every resource* of the British and French bombing formations on such few of the *most important* of the enemy's railway junctions as it may be possible to put out of action with certainty, and to keep out of action. Effort should not be dispersed against a large number of targets, some of which might be remote from the battle area, and, therefore, difficult objectives for sustained and effective attack.

Consequently:

- (a) The French Air Service (reinforced by the British and Italian 'Eastern' [*de L'Est*] air detachments), that is to say 5 Night and 5 Day Groups,¹ has been ordered, in addition to its normal battle duties, to endeavour to destroy the railway stations at:

LAON
ST. QUENTIN
JUSSY
HAM

- (b) To interrupt traffic *in the whole battle area*, the British Air Service should endeavour to destroy the stations at:

PÉRONNE
CAMBRAI
AUBIGNY-AU-BAC
DOUAI

¹ *Author's Note:* The normal composition of a *Groupe de Bombardement*, both for day and night bombing, was 2-3 squadrons (*escadrilles*) of 10-15 aeroplanes each.

3. *Fighting.*

At the present time, the first duty of fighting aeroplanes is to assist the troops on the ground, by incessant attacks, with bombs and machine-gun, on columns, concentrations, or bivouacs. Air fighting is not to be sought except so far as necessary for the fulfilment of this duty. Each Allied Air Command should pursue this policy on the front of its army.

It may be desirable, in the course of particularly important operations, involving only one of the Allied Armies, to reinforce the air units of that army by those of the other. In this case such reinforcements may be asked for by General Head-quarters or by General Foch.

4. *Dissemination of Intelligence.*

To enable the High Command, for the purpose of making important dispositions, to utilize intelligence obtained by aircraft—intelligence that is of the greatest value in the present circumstances—it is necessary to ensure that no delay occurs in the transmission of this information.

Consequently:

- (a) The French Air Service has been instructed to centralize all intelligence in the several air commands, whence it will be transmitted to the G.A.R. by one or other of the following means:

- (i) The existing ground wireless telegraphy organization.
- (ii) Courier service aircraft.
- (iii) In the event of failure of (i) and (ii)—and, in any case, each evening—by motor-car or motor-cycle.

The G.A.R. will forward to General Foch's head-quarters any intelligence received that is likely to interest him.

- (b) Similar arrangements to the above having already been made by the British Air Command, for the centralization of intelligence to meet the requirements of its own General Head-quarters, it only remains to ensure¹ the exchange of important intelligence obtained by both services, British and French, between General Foch and British General Head-quarters.

This exchange may be effected by means of one or other of the following methods:

- (i) By means of a ground wireless telegraphy system connecting British General Head-quarters with BEAUVAIS (General Foch's Head-quarters), working in conjunction with the wireless telegraphy organization of the G.A.R. The preparation of this system to be undertaken by British General Head-quarters in agreement with the Wireless Telegraphy Service of the G.A.R.
- (ii) By means of courier aircraft plying between the aerodrome at British General Head-quarters and BEAUVAIS.
- (iii) Failing the above, and, in any case, at the end of each day, an officer or motor-cyclist will deliver the orders and intelligence reports of the British Air Service to BEAUVAIS and receive those of the French.

(Sgd.) WEYGAND,
Chief of Staff.

¹ Irrespective of the liaison to be established between the flanks of adjoining British and French Armies.

APPENDIX XIX

BRIGADE STRENGTH IN SQUADRONS, 9TH APRIL 1918 (BATTLES OF THE LYS)

	<i>H.Q., R.A.F.</i>	<i>H.Q., IX Brigade.</i>	<i>I Brigade.</i>	<i>II Brigade.</i>	<i>III Brigade.</i>	<i>V Brigade.</i>	<i>VII Brigade.</i>	<i>VIII Brigade.</i>	<i>Totals.</i>
Corps . . .	1 (No. 6 Sqdn.)	..	6 (Nos. 2, 4, 5, 13, 16, and 42 Sqdns.)	5 (Nos. 7, 9, 10, 21, and 53 Sqdns.)	3 (Nos. 12, 15, and 59 Sqdns.)	5 (Nos. 3 A.F.C. 8, 35, 52, and 82 Sqdns.)	..	..	20
Single-seater fighter .	1 (No. 41 Sqdn.)	6 (Nos. 2 A.F.C. 32, 43, 73, 79, and 80 Sqdns.)	6 (Nos. 4 A.F.C. 19, 40, 203, 208, and 210 Sqdns.)	3 (Nos. 1, 29, and 54 Sqdns.)	7 (Nos. 3, 46, 56, 60, 64, 70, and 201 Sqdns.)	5 (Nos. 23, 24, 65, 84, and 209 Sqdns.)	2 (Nos. 74 and 204 Sqdns.)	..	30
Day bombing . .	..	1 (No. 27 Sqdn.)	1 (No. 18 Sqdn.)	2 (Nos. 206 and 98 Sqdns.)	1 (No. 57 Sqdn.)	1 (No. 205 Sqdn.)	2 (Nos. 49 and 211 Sqdns.)	1 (No. 55 Sqdn.)	9
Night bombing .	..	2 (Nos. 58 and 83 Sqdns.)	..	..	1* (No. 102 Sqdn.)	1* (No. 101 Sqdn.)	3 (Nos. 207, 214, and 215 Sqdns.)	2 (Nos. 100 and 216 Sqdns.)	9
Two-seater reconnaissance .	..	2 (Nos. 25 and 62 Sqdns.)	..	1 (No. 20 Sqdn.)	2 (Nos. 11 and 22 Sqdns.)	1 (No. 48 Sqdn.)	..	..	6
		Special Duty Flight.							

* Detached from IX Brigade.

74
and
Special
Duty
Flight.

INDEX

Abbreviations

B. = Battleship

B.Cr. = Battle Cruiser

Br. = British

Cmdre. = Commodore

Commr. = Commander

W/T. = Wireless Telegraphy

Flt. = Flight

Ger. = German

L.Cr. = Light Cruiser

Sqdn. = Squadron

S/M. = Submarine

Officers and men, who are mentioned more than once in the events described, are here given their highest rank

Abee, Ger. aerodrome, bombed, 176, 177, 186, 190, 194, 209, 210n., 211n.

Abeelhoeke, Ger. aerodrome, bombed, 165

Achiet-le-Grand, bombed, 345

Admiralty, British: formation of new Board (Dec. 1916), 3, 4; addition of Fifth Sea Lord to, 4; Anti-Submarine Division of, 3, 4, 45-6; aircraft, policy of, 45-6; views on conversion of *Furious*, 11-13; Operations Committee of, 30-4; Maintenance Committee of, 32; Operations Division of, 33; Naval Intelligence Division of, 49-50

Adriatic Sea, Ger. submarines in, 47

Aelbeke, Ger. aerodrome, bombed, 186

Aerial Activity Office, 146

Aerodromes:

British:

organization, emergency supply schemes, 354-5; evacuations of by R.A.F. Squadrons, 376n.

German:

night bombing, 197; scheme of low flying attacks on (Cambrai), 231; concentrated bombing of, 284-5

Aeroplane Compass Stations, *see* Wireless Telegraphy

Aeroplane Supply Depot, No. 1, 401; No. 2, 354-6

Aeroplanes:

Belgian:

at battles of Ypres, 141

British:

air-bags for keeping planes afloat, 15, 57, 70; aeroplanes used in conjunction with flying-boats, 21-2; launched from ships by catapult,

22-3; exclusively carried in fighting ships, 32; torpedo-carrying, 33; fitted with skid undercarriages, 35; supersede seaplanes for fleet work, 43; in battle and light cruisers, 43-4; relative strength of Allied and German aeroplanes (July 1917), 142

co-operation with balloons in artillery-ranging, scheme of, 150-2. *See also* Artillery co-operation strength: number issued, erected, and reconstructed (Sept. 1917), 202

French: at battles of Ypres, 141, 142 types:

British: Armstrong-Whitworth, 334; Avro, 23; Bristol fighter, 196-7, 291; Bristol Scout, 17; Caudron, 79n.; D.H.4, 21-2, 78, 82, 95, 97-9, 343, 344; Deperdussin, 24; F.E., 155; Handley Page, 65-6, 78, 81-2, 95; R.E.8, 140, 141; S.E.5, 199, 200, 291, 292; S.E.5a, 200n.; Short, 79n., 81; Sopwith bombers, 82; Sopwith 'Camel', 196, 199, 291, 292; Sopwith 1½ Strutter, 34, 38, 48, 79n., 82, 170-1; Sopwith 'Pup', 6-7, 10, 13, 15, 24-7, 29, 34, 70, 73, 198; Sopwith 'Cuckoo', 32-3; Sopwith triplanes, 111; Spad, 135n., 163, 199n.

German: Fokker triplane, 188-9; Gotha, 98

Aertrycke, Ger. aerodrome, bombed, 97, 186n.

Air bags on aeroplanes, *see* 'Flotation Gear'

- Air Board, 4, 24
- Air co-operation with artillery: 113-14, 118-19, 124-5, 213-19; scheme of, for Battle of Cambrai, 230*n.*, App. ix; instructions in, 272-3
- Aircraft carriers, *British*, 6-14; detail of construction, 8-10; light cruisers and other ships fitted as, 10; *Vindex*, or North Sea, type, 13; operations of, 14-16; launching aeroplanes by catapult, 22-3. See also *Almirante Cochrane*, *Argus*, *Campania*, *Cavendish*, *City of Oxford*, *Eagle*, *Engadine*, *Furious*, *Hermes*, *Manxman*, *Nairana*, *Pegasus*, *Repulse*, *Riviera*, *Vindictive*
- Aircraft carriers, *German*, 15*n.*
- Aircraft Depots, number of aeroplanes issued, erected, and reconstructed (Sept. 1917), 202
- No. 1*, 400-1
- No. 1 Reserve*, 401
- No. 2*, 354-7
- R.N.A.S.*, 401-2
- No. 3*, 354, 356, 357
- No. 4*, 354
- Air photography, see 'Photography, air'
- Air raids, *German*, see 'Bombing at-tacks, German'
- Airships:
- British*:
- towing of from light cruisers, 42; for North Sea Barrage, 68. See also 'Submarines, measures against'
- British, Rigid*:
- 'Coastal', 6, 41-2; *C.9*, 61-2; *C.15*, 42; *C.17*, 62; *C.27*, 62; *R.9*, 41; *R.23*, 41; *R.24*, 41; *R.25*, 41; *R.26*, 41
- British, Non-rigid*:
- 'North Sea' (N.S.) type, 40-1; main work of, 42; for anti-submarine patrol and escort work, 59-60; *N.S.1*, 40; *N.S.2*, 40*n.*; *N.S.3*, 40; *N.S.4*, 40; *N.S.5*, 40*n.*; *N.S.6*, 40*n.*
- German*:
- use of flying boats against, 19-21; Zeppelins, 6, 7, 13, 15; patrols by, 19-22; for naval reconnaissance, 43-4; *L.22*, destroyed, 19-20, 21; *L.23*, destroyed, 24-5; *L.43*, 16; destroyed, 20, 66*n.*; *L.44*, escape of, 22
- Albert, bombed, 329; 331
- Allday, Lt. R. P., 376
- Almirante Cochrane*, Chilean B., see *Eagle*
- America, see 'United States'
- 'America' Seaplanes, see 'Seaplanes'
- American Air Service, at Dunkirk seaplane station, 74
- Amiens, Allied Conference at, 138; bombed, 318, 364
- Amiens defence line, 340
- Anglesey, airship station, 76
- Annoeullin station, bombed, 330
- Anthoine, Gen., in command of French First Army, 138
- Anti-aircraft defences (Fifth Army front), 305*n.*, 390, 392-4
- Anti-aircraft guns, *German*, used against tanks, 244-5
- Anti-Submarine measures, see 'Submarines, Measures against'
- Anti-Submarine Division, see 'Submarines, Measures against'
- Antwerp, 103
- Argus* (formerly *Conte Rosso*), Br. aircraft carrier, 10, 11; proposed conversion as carrier of torpedo aircraft, 28, 31; 32; changes in design of, 36-7
- Armstrong, Messrs., 10, 14, 23, 41
- Armentières, bombed, 379, 387
- Armin, Gen. Sixt von, 110, 112
- Army:
- Belgian, 138, 139, 386
- British: extension of line in France, 263-4; Carey's Force, 340
- First*: 112, 130, 142, 151, 271, 272, 299, 323, 324, 328, 337, 362, 368, 371, 372, 373, 377, 378, 398
- Second*: 110-13, 119, 120*n.*, 127*n.*, 135, 139-41, 145, 156, 161, 178*n.*, 180, 181, 185, 186, 191-3, 206, 271, 272, 328, 346, 368, 371, 377-9
- Third*: 111-13, 139, 179, 228, 230, 249*n.*, 250, 259, 264, 266, 267*n.*, 268, 269, 271-3, 277, 279, 280, 282-4, 286-8, 292, 293-5, 298-302, 304-9, 312-14, 315*n.*, 319, 320, 322-5, 331, 332, 335, 337, 362, 363, 371-3
- Fourth*: 93, 111, 139, 140, 151, 340, 361

Army: British—*continued*

Fifth: 112, 113, 139, 140, 145, 146, 150, 156, 159-61, 172, 176, 180, 182, 184, 191, 264, 264*n.*, 265, 266, 267*n.*, 268, 269, 271-3, 277, 279-81, 283, 284, 286-8, 290, 292, 293, 295-8, 301-4, 306-9, 311, 313, 314, 319, 321, 323-7, 334, 335, 340, 371-3

Corps:

II, 139, 140*n.*, 161, 174, 180

III, 179, 250, 295, 301, 303, 325

IV, 240*n.*, 245, 293, 307, 314, 319, 320

V, 139, 180*n.*, 272*n.*, 309, 313, 314, 319, 320, 322, 325

VI, 295, 307

VII, 131, 250, 303, 307, 309, 320, 322, 325, 325*n.*, 326, 363

VIII, 111, 139, 180*n.*

IX, 111, 127, 180*n.*, 296, 371

X, 111, 126, 127, 131, 135, 180*n.*

XI, 368, 369*n.*, 371, 372, 376

XIV, 139, 140*n.*, 159, 174*n.*, 177, 180*n.*, 205

XV, 140, 149, 368, 368*n.*, 369*n.*, 371, 372, 375

XVII, 337-8

XVIII, 139, 140*n.*, 161, 174, 177, 180*n.*, 301, 303, 309, 325, 326

XIX, 139, 140*n.*, 161, 174, 302, 303, 307, 309, 310, 325, 326

Anzac I: 180*n.*; *Anzac II*: 111, 127, 128, 133, 136; *Canadian*: 169, 171

Cavalry: 319

Tank Corps: 228, 314

Cavalry: *Divisions*, 1st, 335, 340; 2nd, 345; *Regiments*: 1st King Edward's Horse, 374

Artillery: *Batteries*, 114th Siege, 315; 53rd Battery, 14th Australian Field Artillery Brigade, 392, 393

Royal Engineers: Sound Ranging Section, 151

Divisions: *Guards*: 159, 255; 1st, 147; 262-3, 293; 3rd, 381; 5th,

380; 8th, 335, 345; 9th, 371, 377, 397; 12th, 179; 19th, 371; 21st, 397; 25th, 127, 371; 29th, 250, 255; 33rd, 381; 34th, 371, 377; 36th, 315; 40th, 245, 371, 374; 50th, 303, 369, 369*n.*, 371, 374, 380; 51st, 240, 244, 245, 369*n.*, 371, 374, 381; 55th, 369, 371, 375, 377; 61st, 303, 381; 62nd, 241*n.*; 66th, 335; 3rd *Australian*, 133; 4th *Australian*, 133; 1st *Canadian*, 171

Infantry Brigades: 140th, 254

Companies: 24th Machine-gun, 392, 393

Cyclists: 11th Battalion, 374

Army Printing Section, 119*n.*

French: plan for co-operation in Ypres offensive (1917), 138, 139; Eastern Group of Armies, British bombing squadrons with, 284; Group of Armies of the Reserve, 319

First: 138, 141, 145, 160, 161, 172, 175

Third: 319

German:

Second: 230-1, 273, 329*n.*

Fourth: 110, 112, 141-2, 370-1, 377, 386

Sixth: 370, 370*n.*, 371, 386

Seventh: 245

Seventeenth: 273

Eighteenth: 265, 265*n.*, 273

Corps: 4th, 110; *XIV Reserve*, 147

Divisions: 2nd Guards Reserve, 301; 4th Guards, 339*n.*; 1st, 339*n.*; 111th, 301, 304; 243rd, 341*n.*

Regiments: 2nd Foot Guards, 327; 2nd Guards Reserve, 321; 8th Grenadier, 316; 12th Grenadier, 316; 52nd, 304; 52nd Reserve, 315, 321; 66th, 300; 73rd, 300-1; 76th, 304; 100th Grenadier, 322*n.*; 101st, 341*n.*; 114th, 345-6; 116th, 300; 120th, 299; 122nd, 342; 202nd Reserve, 376*n.*; 248th Reserve, 321; 261st Reserve, 315; 352nd, 281*n.*; 1st Uhlans, 394; 2nd Bavarian, 299; 10th Bavarian, 300

Portuguese, 368, 370*n.*, 374

Divisions: 1st, 368; 2nd, 368, 369, 371

Army—*continued*

United States: 6th U.S. (Railway)
Engineer Regiment, 325
Arras, German attacks at (1918),
336-7

Artillery Co-operation:

British Aeroplanes: at Messines, 124-5, 127-8, 130-1; value of, at Messines, General Staff notes on (S.S. 170), 136-7; sound ranging, 151-2; Battle of Langemarck, 171-5; at Battle of Menin Road Ridge, 184; developments in, 213-19; during German preparations for Offensive (1918), 278; in German attack at Arras, 337; 150-2, 162, 171, 172-4, 184, 202-3, 206, 207, 210, 218-19, 294, 300*n.*, 309, 310, 315, 319, 320, 331, 339, 343, 358-61, 369, 373, 386, 387, 398, 400

Balloons: 210, 337, 382

German: 117, 119-20, 135, 249, 403

Asquith, Rt. Hon. H. H., 3

Ath station, bombed, 190

Athies, bombed, 322

Aubenchaul station, bombed, 317

Aubigny-au-Bac, bombed, 248

Auchel (Lozinghem) aerodrome, 272, 328, 336, 372, 379

Audenarde, bombed, 123

Aulnoye junction, bombed, 283, 316

Aurora, Br. L.Cr., Deperdussin mono-
plane flown from, 24

Australia, Australian B. Cr., 31; ex-
periments with flying two-seater
aeroplane from, 38

Australian Flying Corps, *see* 'Squad-
rons'

Avelin, Ger. aerodrome, bombed, 322

Awoingt, Ger. aerodrome, bombed,
234

Bachmann, Lieut., pilot of German
seaplane, 71

Bacon, V.-Ad. Sir R. H. S., 70, 73-4,
80, 82-3, 85-6, 89*n.*, 90-2, 101

Bailleul, bombed, 386; loss of, 386

Bainville-sur-Madon, 198*n.*

Balfour, Rt. Hon. A. J., 3

Ball, Capt. A., 200

Balloon ships, 10. *See also* *Canning*,
City of Oxford, *Menelaus*

Balloons:

British Naval, with the Fleet, 38-9,
63-4; against submarines, 39, 46,
47, 63-5, 68, 76. *See also* 'Grand
Fleet'

British Military, at Battle of Mes-
sines, 118, 127, 127*n.*, 128, 135;
used for propaganda dropping,
226; Co-operation with aeroplanes
at battle of Ypres in artillery work,
development of, 150-2; 155, 184;
at battle of Cambrai, 231; German
offensive 1918, 278, 315*n.*, 337,
356, 373, 382. *See also* 'Orders of
Battle', Apps. iii, v, x, xv

Companies:

No. 8, 140; *No. 9*, 141; *No. 13*, 140;
No. 17, 140; *No. 20*, 140; *No. 28*,
315*n.*

Wings:

Fourth, 150

German: 85-6, 114-15, 384-5, App.
xiii

Banteux ravine, Cambrai counter
attack at, 250-1

Bapaume, 231, 322; bombed, 324-5,
329, 337, 341, 344-7, 350-1, 379,
385, 387

Barisis, southern limit of British line,
263-4

Barlow, 2nd Lt. L. M., 130

Bartolomé, Capt. C. M. de, R.N., 6*n.*

Battleships, fitted for towing balloons,
39

Bavai station, bombed, 283

Bayonvillers, bombed, 342

Beardmore, Messrs. Wm. & Co., 10,
41

Beatty, Ad. Sir David, appointed Com-
mander-in-Chief Grand Fleet, 3;
his views on aircraft co-operation,
4-5; and mine-laying in Heligoland
Bight, 5; appoints Grand Fleet Air-
craft Committee, 5-6; views on con-
version of light cruisers to aircraft
carriers, 11-12, 15; views on fighter
aeroplanes in light cruisers, 25, 28-9;
naval air policy, 28; proposals for
torpedo aircraft offensive on German
High Sea Fleet, 33; suggests ap-
pointment of Rear-Admiral for Air,
34; views on value of kite balloons,
38; comments on the value of

Beatty, Ad. Sir David—*continued*
 Zeppelins, 43; scheme for use of balloons in destroyers for U-boat hunting, 63
 Beaudignies, bombed, 283
 Beaumont Hamel, 362
 Becelaere, bombed, 191*n*.
 'Beef Trip', the, 51, 64
 Belgian Army, *see* 'Army, Belgian'
 Belgian Coast:
 German destroyer and U-boat bases, 78; importance of, 103; bombardment of (May and June 1917), 82-6, (Sept.-Dec. 1917), 89-90, 97; effect of German smoke screens, 86, 89-90; German defences of, 83, 89, 102-3; mine barrage reinstituted, 86-7; German *Fernlenkboot*, successful attack on Monitor *Erebus*, 87-8; projected landings on, 90-2, 139; air photographic survey of, 91-2; German Bombing Squadron (No. 3), attacks on London by, 98, counter-measures against, 99; German Bombing Squadron (No. 1), attacks Naval Air Service Depot, Dunkirk, 99-101; importance of air photography of, 102-3; bombing operations against bases analysed, 103-8; flights over, by H.M. King of Belgians, 108
 Air Offensive, policy, 92-4
 Allocation of duties of R.N.A.S. (Dunkirk) Squadrons, 81
 Balloons, *German*, 85-6
 Bombing programme, 78, 94-5, 103, 105-8
 Bombing attacks, *British*, 79-82, 95-7, 101, 106. *German*, 79-80, 87-8, 98-101
 Escorts, fighting, 69-72, 84-5, 95
 Fighting in the air, 69-72, 84, 87, 89-90, 108
 German Air Service, 69-72, 84-5, 87, 89-90, 98-101
 Patrols: *Anti-submarine*, 69-74; sinking of *U.C.72*, 73, 102; *Bar-rage*, 86-8, 92-3; *Offensive*, 85, 93, 96, 98
 Photography, air, 79, 81-2, 84; survey of landing beaches, 90-2, 102-3

Reconnaissances, air, 79, 81, 102
 Spotting for H.M. Ships, 84-5, 89
 Below, Gen. Otto von, 268*n*.
 Bembridge (Isle of Wight) seaplane station, 48, 76
 Bennett, Flt. Sub.-Lt. L. J., 70
 Berclau, bombed, 169
 Berhaven, suggested base for air patrols, 46
 Bergues aerodrome, 74
 Bernes, bombed, 311
 Bertangles aerodrome, 272, 397
 Bertry, Ger. aerodrome, bombed, 284
 Béthencourt, bombed, 318
 Bevern, Ger. aerodrome, bombed, 176-7
 Beythem, bombed, 330
 Bieber, pilot of German seaplane, 71-2
 Biefvillers-les-Bapaume, bombed, 324
 Biles, Sir John H., 8-9
 Bigsworth, Wing Commr. A. W., 48
Birchgrove, Br. collier, 57
Birkenhead, Br. L.Cr., 31
Birmingham, Br. L.Cr., 39
 Bishop, Capt. W. A., awarded Victoria Cross, 129
 Bisseghe, Ger. aerodrome, 156, 193, 194; bombed, 123, 131, 186, 208, 209, 211*n*., 313; low-flying attacks on, 130, 178
 Bixchoote, 386
 Blomfield, Maj. R. G., 200
 Boddy, Lt. J. A. V., 246
 Boelcke, *Hauptmann* Oswald, 394, 395
 Bohain, bombed, 280-3
 Bombing:
 Policy and programmes:
 Belgian Coast operations: 78-9; combined aircraft and motor-boat operations, 80-1; views on relative value of day and night bombing, 94-5; counter measures against German bombing squadrons, 99, 152-5, 197-8; analysed, 103-8; duel between ferro-concrete and bomb, 104; during *batlle of Mes-sines*, 122; during *battles of Ypres* (1917), 143-5, 176, Apps. vi, vii, viii; during *battle of Cambrai*, 230-2, 242*n*., 250, 255, App. ix; during *German offensive* (1918), 272, 277; G.H.Q. instructions on general policy, 278-9; 280-6, 290, 312,

Bombing—*continued*

322-4, 328-30, 335-6, 341, 343, 347; Gen. Foch's instructions, 348-9, App. xviii; 373, 380, 381*n.*, App. xiv

Attacks:

(British), *Belgian Coast operations:* 79-82, 95-7, 101, 106; during *battle of Messines*, 122-4, 125, 131-3, 134; during *battles of Ypres* (1917), 94-9, 155-6, 162-5, 169-70, 179-80, 181-8, 191, 193-5, 197-8, 201-2, 206-9, 210*n.*, 211, Apps. vi, viii; during *battle of Cambrai*, 240-1, 244, 247-8, Apps. ix, xi; during *German offensive*, 1918, 280-6, 296-7, 304, 306, 311-13, 317*n.*, 318, 321-7, 328-32, 335-8, 341-7, 350, 372-3, 376, 379, 383-7, 388, 397-8

(German), 16, 79-80, 87-8; on London and Dunkirk, 98-101; 125, 134, 135, 148-9, 152-5, 306, 318, 330, 345, 356, 363-4, 401-2, App. xiii

Statistics, 106, 179*n.*, 186*n.*, 191*n.*, 201-2, 317*n.*, 324-5, 336, 341-2

Bombs: 230-lb. for anti-submarine work, 54; 520-lb., dropped from Short seaplanes, 80; Cooper 25-lb., 122*n.*; Hales, 20-lb., 122*n.*

Boraston, Lt.-Col. J. H., 256*n.*

Borkum, Ger. seaplane base at, 14*n.*

Boulogne, bombed, 364

Bourlon, 228, 235, 241-50; Ger. counter attacks at, 253-4, 256, 257, 259

Boyd, Chief Petty Officer E. A., 73

Boyle, Lt.-Col. the Hon. J. D., 150

Brancourt-le-Grand, bombed, 281

Bray Dunes, engine repair-shop and depot at, 100-1; aerodrome, 81*n.*; bombed, 148*n.*

Brebières station, bombed, 241, 330

Bridport, 76*n.*

Brigades (R.F.C. and R.A.F.), strengths, in squadrons (9 Apr. 1918), App. xix

I, 142, 186*n.*, 196, 198, 230, 230*n.*, 231, 241, 250, 304, 306, 312, 320, 321*n.*, 323, 324*n.*, 330, 332, 333, 335, 337, 345, 347, 350, 371-2, 377-8, 380, 381*n.*, 382*n.*, 383-4, 386-7, 400-1, App. ix

II, 111, 119*n.*, 140, 141, 144, 155, 175, 181, 181*n.*, 185, 204, 304, 312, 323, 324*n.*, 330, 332, 335, 337, 346*n.*, 373, 377, 377*n.*, 378, 382*n.*, 383-4, 386, 398, 400-1

III, 142, 143, 150, 178*n.*, 179, 196, 230-1, 311, 312*n.*, 317*n.*, 320, 321, 321*n.*, 323, 324*n.*, 327, 335, 356-7, 371-2, 382*n.*, App. xi

IV, 140, 144, 146

V, 140, 144, 146, 158, 175-8, 186, 194, 204, 288, 290, 306, 317*n.*, 320, 321*n.*, 323, 324*n.*, 327, 329, 341, 342, 345, 351, 356-7, 372, 382*n.*, 388, App. vii

IX, formation of, 272*n.*; 322, 324*n.*, 372, 379, 380, 381*n.*, 382*n.*, 384, 398

Broke, Br. Flotilla leader, 81

Broodseinde, attack on, 202-4

Brooke-Popham, Brig.-Gen. H. R. M., 355-7, 400, 401

Brown, Capt. A. R., 389-93, 392*n.*

Bruce, Talbot Baines, 'Missing', 213

Bruges: German destroyer and U-boat base, 47, 78, 103; concentration of torpedo and submarine craft at, 79; development of as a German Imperial dockyard, 103; defence of, against bombing aircraft, 103-4; construction of ferro-concrete shelters and buildings at, 104-5; importance of as Naval bombing target, 105-6; bombed, 79, 95-7; weight of bombs dropped on (1917), 106

Brussels, Br. S.S., 51

Buie, Gunner R., 392

Buire, bombed, 346

Buncrana, 59

Burgh Castle, 77

Burney, Ad. Sir Cecil, 3*n.*

Busigny, bombed, 282-5, 296, 304, 312

Busteed, Lt.-Col. H. R., 23, 35*n.*

Butcher, Flt.-Lt. O. A., 63

Byng, Gen. Hon. Sir Julian H. G., 228, 319

Caix, bombed, 342, 346

Calais, shelled by Ger. destroyers, 81; bombed, 364

Caldale, air station, 76

Caledon, Br. L.Cr., 25, 39

Calliope, Br. L.Cr., 39

- Calshot, air station, 48, 55, 68, 76
 Camblain-l'Abbé, British aerodrome bombed, 330
 Cambrai, 329*n.*; bombed, 312, 321, 329, 330, 332, 345
 Cambrai, Battle of (20th Nov.-7th Dec. 1917): 227-59; plan of operations, 228-9; front of attack, 228; German defence system, 229; employment of tanks, 227, 232, 234-5; air concentration for, 230-1, App. x; scheme of employment of R.F.C., 230-2, Apps. ix, xi; British and German air strength, 230-1, App. x; opening of the battle, 234; checks at Flesquières and Masnières, 234-41; actions at Bourlon Wood and village, 241-8; German reinforcements, 242-3, 247; actions at Fontaine-Notre Dame, 244-8; German counter attack, 250-6; cessation and resumption of special bombing operations, 250; general comments, 256-9; work of R.F.C. and casualties, 257-8; German low-flying attacks, 258-9, App. xii; importance of air observation, 259; lessons of the battle, 260-1; court of inquiry on causes of success of enemy counter attacks, 252
 Air offensive, policy, 230-2, 244, 257-8, Apps. ix, xi
 Allocation of duties of R.F.C., 230-2, Apps. x, xi
 Artillery co-operation (aeroplane); *British*, 228, 231, 239, 251, 254, 259; *German*, 249
 Balloons, British, 231
 Bombing programme, 230-2, 242*n.*, 250, 255, Apps. ix, xi
 Bombing attacks, 240-1, 244, 247-8
 Contact patrols, 240, 254, 255
 Fighting in the air, 233, 241*n.*, 244, 246, 248, 252, 255-6
 German Air Service, 230-1, 232-3, 243, 245-6, 248-9, 251, 258-9, App. xii
 Low-flying attacks by aeroplanes: *British*, 230-9, 243, 245-7, 251, 253-4, 255, 256-7, Apps. ix, xi; *German*, 241, 244, 250-5, 258-9, App. xii
 Patrols: *Offensive*, 232, 254, 258, Apps. ix, xi
 Photography, 256
 Reconnaissances, air, 239-40, 243, 248, 251-2, 255, 259, Apps. ix, xi
Campania, Br. aircraft carrier, 6, 8, 9, 29, 43, 77; retained for training purposes, 32, 43; balloons on, 39
 Canal du Nord, 253, 268
 Candas, 354-7
 Cannan, Brig.-Gen. J. H., 393
Canning, Br. balloon ship, 10, 11*n.*, 39
 Cantaing, 241, 245
 Capel, air station, 60, 76
 Carey, Brig.-Gen. G. G. S., 325, 326
 Carey, R. F., 23
 Carnières, Ger. aerodrome, bombed, 234
Carolbank, Br. armed drifter, 56
 Carson, Rt. Hon. Sir Edward H., 3*n.*
Cassandra, Br. L.Cr., 26
 Castelnau, Gen. de, 284
 Castres, bombed, 306
 Casualties:
 (R.F.C. and R.A.F.), during battle of Messines, 119*n.*; during battles of Ypres (1917), 166, 190*n.*, 207, 209, 210; during battle of Cambrai, 239, 239*n.*, 243, 244, 247, 255-6; during German offensive (1918), 285, 289, 298-9, 306, 313, 316*n.*, 317, 327, 340, 346, 377, 389
 (German Air Service), 255, 305, 312, 317, 340, 348, 351, 377, 384, 386, 387
 Catapult experiments for launching aircraft from ships, 22-3
 Catfirth, seaplane station, 68, 77
 Catigny, aerodrome, 313
 Cattewater, seaplane station, 46, 48, 76
 Caudry, Ger. aerodrome, bombed, 234
Cavendish, Br. L.Cr., redesigned as an aircraft carrier (renamed *Vindictive*), 14, 32
 Cérisy-Gailly, 338; bombed, 339, 346
 Chadwick, Flt. Commr. A. J., 87*n.*
 Champien aerodrome, 297*n.*, 301
 Charlton, Brig.-Gen. L. E. O., 290, 323
 Château du Sart, Ger. aerodrome, low-flying attacks on, 178; bombed, 186*n.*
Cbatbam, Br. L.Cr., 31
 Chaulnes station, bombed, 387-8
 Cherbourg, seaplane station, 48, 68, 76

- Chester*, Br. L.Cr., 39
 Chocques aerodrome, 376*n*.
 Childers, Major Erskine, 105
 Chilean battleship, see *Almirante Cochrane*
 Chuignolles, bombed, 338, 342
 Churchill, Rt. Hon. Winston S., *The World Crisis*, 262; Minister of Munitions, 274
City of Oxford, Br. balloon ship, 10; later aircraft carrier, 11*n*.
 Claye, Capt. H., 289
 Clemenceau, M. Georges, 263*n*., 328*n*.
 'Cleveland' Convoy, 61
 Collishaw, Flt. Sub-Lt. R., 121
 Comines, bombed, 179, 383
 Compass stations, see 'Wireless Telegraphy'
 Compiègne, conference at, 328
 Communications, Railway:
 Allied: German bombing of, 318, 364
 German, 95-7, 265, 266; air reconnaissance reports of train activity, 122, 243, 367, 369-70; low-flying attacks on, 178-9, 180*n*., 181; bombed, 122-4, 132-3, 156, 162, 165, 169, 172, 178, 186-9, 191, 194, 206, 208-9, 211, 211*n*., 230, 241, 247-8, 250, 255, 280-5, 296, 304, 311-12, 316-17, 329-31, 345-8, 350-1, 373, 379, 385, 387-8
 Conferences, Inter-Allied: Paris, 4-5 May 1917, 109; Amiens, 18 May 1917, 138; Compiègne, 25 March 1918, 328; Doullens, 26 March 1918, 328
 Army Commanders, Doullens, 266, 268
 Constantinople, German submarines at, 47
 Contact Patrol:
 (British), 48; during *battle of Mesines*, 115*n*., 118, 125-8, 133; during *battles of Ypres (1917)*, 161-2, 166-9, 173-5, 180, 191-2, 203, 204, 206, 209-11; during *battle of Cambrai*, 240, 254, 255; during *German offensive (1918)*, 272-3, 296, 302, 307, 309, 311, 326, 331, 338-9, 361, 375-8, 382, 386-8, 397-400
 (German), 376
 Convoy system, see 'Submarines, German, measures against'
Cordelia, Br. L.Cr., 26
 Cortemarck, bombed, 97
 Coucou, Ger. aerodrome, bombed, 131
 Coudekerque, aerodrome, 81*n*.
 Counter-attack patrols, see 'Patrols'
Courageous, Br. aircraft carrier, 9*n*., 11, 26, 28, 31, 37
 Courcellette, bombed, 329
 Courtrai, bombed, 132, 164, 178-9, 211*n*., 250
 Cranwell air station, 4*n*., 76
 Croisilles, bombed, 350
 Cross, Lt. M. W. W., R.N.V.R., 67*n*.
 Crozat Canal, 302, 303
 Cruiser Squadrons: 1st Battle, 34; 1st Light, 24, 25; 2nd Light, 26; 3rd Light, 25; 4th Light, 26; 6th Light, 26
 Cruisers, battle: fitted with turret platforms, 31; fitted for towing balloons, 39; fighter aeroplanes in, 43-4
 Cruisers, light: fitted as aircraft carriers, 10; fighter aeroplanes in, 23-6, 43; rotatable flying platform for, 31; fitted for towing balloons, 39
 Cruyshautem, Ger. aerodrome, bombed, 198
 Cuerne, Ger. aerodrome, 156; bombed, 165
 Cunnell, Capt. D. C., 142*n*.
 Curtiss America flying-boats, see 'Seaplanes'
 Cutlack, F. M., *The Australian Flying Corps*, 239*n*.
 Dadizeele, ammunition depot, bombed, 133
Daily Mail, 274
 Dakar, 59
 Davies, Flt. Sub-Lt. G. L., 70*n*.
 Davies, Air Mechanic H. M., 20, 67
 Dechy station, bombed, 244, 247, 255, 345, 347, 350, 373
 Deck landings, 26-30
Defence, Br. cruiser, 12
 Defensive measures, British, development of, after Cambrai, 261-4; *G.H.Q. Memorandum on*, 261; *Principles of Defence on the Fifth Army*

Defensive measures—*continued*

Front, 265–6*n.*; von Ludendorf on, 270–1; *Employment of the Royal Flying Corps in Defence*, 263, 277, 286, App. xiv

Denain, bombed, 247, 283, 289

de Robeck, V.-Ad. Sir J. M., 38

Destroyer Kite Balloon Force, 38–9, 63–4

Destroyers:

British, fitted for towing balloons, 38–9; co-operation with seaplanes, 48; carrying balloons for anti-U-boat operations, 63–4; for North Sea Barrage, 68. See also *Falcon*, *Llewellyn*, *North Star*, *Paragon*, *Patriot*, *Simoon*

German, 54, 72; activity of, in Dover Straits, 78, 80, 81; at Zeebrugge, 78, 79; in Belgian ports, 80; engagement with British Flotillas (21 Apr. 1917), 80–2

G.42, sunk, 81; *G.85*, sunk, 81;

G.88, bombed, 81; *S.20*, sunk, 85

Desvres, 401, 402

Deutschland battery, 89. See 'Belgian Coast'

Devonport, 59, 64*n.*

Dewar, G. A. B., 256*n.*

Dickey, Flt. Sub-Lt. R. F. L., 20, 64, 66*n.*

Don, station bombed, 172, 330, 347, 373, 379, 385

Donibristle, naval air base, 34, 43, 77

Dorignies, Ger. aerodrome, bombed, 170, 172

Douai, station bombed, 244, 247, 255, 345, 347, 373, 385

Douglas, Flt. Commr. N. Sholto, 67*n.*

Doullens, conference at, 266, 268, 328

Douvrin, bombed, 172

Dover: Dover-Dunkirk anti-submarine air organization, 69–74

Dover, shelled by German destroyers, 81; air station, 69, 76–7, 100

Dover, Straits of, U-boat hunting in, 69; efforts to close against U-boats, 74; German destroyer activity in area of, 78, 80, 81

Draibank, 204

Drifters, British, Ger. destroyer attacks on, 78

Drocourt, bombed, 347

Dublin, Br. L.Cr., 16, 26; fitted with revolving flying platform, 31

Du Cane, Lt.-Gen. Sir J. P., 140

Duff, Rear-Adm. A. L., Director of the Anti-Submarine Division, 4, 45; on Operations Committee of Board of Admiralty, 30*n.*; scheme for additional air patrols, 45; on use of aircraft for anti-submarine measures, 46; Assistant Chief of the Naval Staff, 53

Dumaresq, Capt. J. S., R.N., 29, 31

Dundee seaplane station, 68, 77

Dunkirk, bombed, 79–80, 99–100, 197, 364

Dunkirk: Air Command, units of, 33, 69–74, 146; operations from, 78–108; air photography, 79; re-organization of, 81, 102; seaplane unit disbanded, 102

Bombing operations (1917) analysed, 106–8

Bombing squadrons placed under orders of C.-in-C., 281*n.*

See also 'Belgian Coast'

Dunnell, R. F., 30*n.*

Dunning, Sqdn. Commr. E. H., 13, 27

Düren, bombed, 101

Dutch convoys, 51

Dyck, —, pilot of German seaplane, 71–2

E.22, Br. S/M., as carrier of aircraft, 24*n.*

Eagle, Br. aircraft carrier (formerly the Chilean *B. Almirante Cocbrane*), 32; reconstruction of, 37

Eastchurch, Naval air station, 154*n.*

East Fortune, air station, 6*n.*; decision to concentrate N.S. airships at, 40, 41, 60, 76

Egerton, Flag-Commr. W. A., 6*n.*

Elles, Brig.-Gen. H. J., 228

Elwyn, Lt. G. M., 332

Emerchicourt, Ger. aerodrome, bombed, 282

Ems, Ger. submarine flotilla, 2

Engadine, Br. aircraft carrier, 8–9, 43

Engines, Aero: *types*: Anzani, 16, 79*n.*; Clerget, 79*n.*; Curtiss, 16, 17; Fiat, 40*n.*; Hispano-Suiza, 33, 135*n.*; Le Rhone, 70; Rolls-Royce, 17, 18, 40, 79*n.*, 82; Sunbeam Arab, 33

- Erebus*, Br. monitor, at bombardment of Zeebrugge and Ostend, 83-5, 97; attacked by German motor-boat *Fernlenkboot*, 87-8
- Ervillers, bombed, 350
- Escanaffles railway, bombed, 123
- Escaufourt, Ger. aerodrome, bombed, 284, 285
- Escaut, Canal de l', 229, 235
- Estaires, 376; bombed, 376, 379-80, 383-5
- Estrées-en-Chaussée, bombed, 336
- Etreux, Ger. aerodrome, 272*n.*; bombed, 280-3
- Evans, Gunner W. J., 392
- Evan-Thomas, R.-Ad. Sir Hugh, 5, 6*n.*
- 'F' or Felixstowe boats, *see* 'Seaplanes (Types)'
- Fair Island Channel, 77
- Falcon*, Br. destroyer, 80
- Falmouth, 45, 59
- Falmouth*, Br. L.Cr., 1
- Fayolle, Gen., 319, 328, 348*n.*
- Felixstowe, air station, development of flying boats at, 16-19, 24*n.*, 53-5, 57, 70*n.*, 74, 76; bombed, 64, 98
- Fernlenkboot*, German electrically controlled motor-boat, attack on *Erebus* by, 87-8; destruction of, 88
- Fienvillers aerodrome, 313, 355-6, 357*n.*; bombed, 356
- Fighting in the air: fighting formations, 286-7, 351-2, App. xvii; increase of (24th Mar. 1918), 317-18; by night, 330; Gen. Foch's instructions, 348-9, 351, App. xviii; Gen. Fayolle's Orders, 349*n.*; during *Belgian Coast operations*, 67, 69-72, 84, 87, 89-90, 108; during *battle of Messines*, 119-21, 123, 129, 132-3, 134; during *battles of Ypres (1917)*, 155-8, 175, 185-6, 188-90, 194-6, 205, 207-8, 210-11; during *battle of Cambrai*, 233, 241*n.*, 244, 246, 248, 252, 255-6; during *German offensive (1918)*, 284-6, 287-92, 297-9, 304-6, 308, 310, 312-13, 317-18, 327, 330, 333-4, 336, 339-40, 343-6, 348-9, 351-2, 376-7, 379, 384, 386-7, 389-97, 398, 400, Apps. xiv, xvii, xviii
- Fisher, Lord, 12
- Fisher, Capt. W. W., R.N., 53*n.*
- Fishguard, air station, 47, 48, 48*n.*, 76
- Flanders I*, *see* 'Zeebrugge'
- Flanders II*, *see* 'Ostend'
- Flares, use of, at battle of Messines, 125-6; at battles of Ypres (1917), 161-2. *See also* 'Contact Patrol'
- Fleet, Grand, influence of U-boat campaign on movements of, 1; Ad. Sir D. Beatty appointed to command, 3; his views on aircraft co-operation, 4, 12; Aircraft Committee of, 5-8, 10, 11, 13, 21, 23; Airships with, 6, 40-2; Battle Orders for aircraft (Jan. 1917), 6*n.*; Aircraft Carriers with (Jan. 1917), 8; new proposals, 8-14, 34-7; aircraft operations, 14-16, 26; Balloons with, 10, 11, 38-9, 63-4; catapult launching experiments, 12-13; fighting aircraft in light cruisers, 23-6; destruction of Zeppelin *L.23*, 24-5; deck landing experiments, 27-8; flying from gun turrets, 29-31, 38; Admiralty air policy, 28-9; Operations Committee of the Board of Admiralty, 30-3; new proposals for fleet aircraft, 30-1; torpedo aircraft, 32-3; proposed air offensive against German High Sea Fleet, 33; Shore Air Bases of, 34; the appointment of a R.-Ad. for Air, 34. Grand Fleet aircraft, general summary, 42-4. *See also* *Argus*, *Campania*, *Canning*, *City of Oxford*, *Courageous*, *Eagle*, *Engadine*, *Furious*, *Glorious*, *Hermes*, *Manxman*, *Menelaus*, *Nairana*, *Pegasus*, *Vindex*, *Vindictive*
- Battle Squadron, First, 4; Second, 38
- Battle Cruiser, 12, 14
- German High Sea, 1, 2, 5; proposed torpedo aircraft attack on, 33
- Flesquières, 234-42; salient at, 293, 295, 308
- Fleurbaix, bombed, 379
- Flights:
 - German, *see* German Air Service
 - R.F.C. and R.A.F., Special Duty Flight, 111-12, 372
- Flotation gear, 15, 57, 70
- Flugzeugmeisterei*, *see* 'German Air

Flugzeugmeisterei—continued

Service, expansion of (American programme);

Flying-boats, *see* 'Seaplanes'

Foch, Gen. Ferdinand, appointed to co-ordinate the efforts of the French and British Armies in France, 327, 328, 328*n.*; instructions to R.A.F., 348-9, 351, App. xviii

Fontaine-Notre Dame, 241, 243, 244-7

Fontaine-Uterte, bombed, 281

Formation Flying, 115, 118, 120-3, 132, 351-2; size of formations, 286-7, App. xvii

Foucaucourt village, bombed, 344

Fox, Capt. F. M., 38

Freeman, Lt.-Col. W. R., 320, 344

Frélinghien, bombed, 383

French air services, in anti-U-boats operations, 68; at battles of Ypres (1917), 144-5, 158; strength of, on Western Front (1 Apr. 1918), 350

French Army, *see* 'Army, French'

Fresnoy-en-Chaussée, bombed, 342

Fresnoy-le-Grand, bombed, 281

Fricourt, bombed, 329

Fry, Sub-Lt. H. O., R.N.V.R., 67*n.*

Fuller, Brev.-Col. J. F. C., *Tanks in the Great War*, 234*n.*, 235*n.*

Furious, Br. aircraft carrier, 9*n.*; conversion of, 10, 11-13, 26, 28, 30-1; experiments in deck landings on, 26-8, 34, 35-7, 43

Furnes aerodrome, 81*n.*

Galpin, Flt.-Lt. C. J., 19, 20

Gamble, C. F. Snowden, *Story of a North Sea Air Station*, 22*n.*

Game, Brig.-Gen. P. W., 213, 354

Gardner, Flt. Lt. R. G., 101

Geddes, Sir Eric C., 30*n.*

Gena, Br. S.S., 56

George, Rt. Hon. D. Lloyd, 3, 262

German Air Service:

development and expansion of (American programme), 273-6; employment of battle flights (Schlachtstaffeln), 252*n.*, 253*n.*, App. xii; *North Sea*, 5, 14-15, 21, 43, 44; torpedo aircraft attacks on British shipping, 55-8, 62; in *Belgian Coast area*, 69-72, 84, 87, 89-90, 98-101; during *battle of*

Messines, 132-5; during *battles of Ypres (1917)*, Strength, 141-2, 156, 166, 196-7; during *battle of Cambrai*, Strength, 230-1, 245-6; 232-3, 243, 248-9, 251, 258-9, App. xii; during *German offensive (1918)*, 269; Strength, 273-6, 349-50, App. xvi; 277*n.*, 312, 317, 327, 336, 339-40, 345, 348, 349-50, 351-2, 363-5, 372, 379, 384, 388, 398, 400, 403-4, App. xiii

Casualties: see 'Casualties (German Air Service)'

Flights: Battle (Schlachtstaffeln), 253*n.*, App. xii; *Fighter* (Jagdstaffeln), No. 2, 394; No. 4, 156, 245, 248-9; No. 5, 232, 245; No. 6, 156, 245, 248-9; No. 10, 156, 245, 248-9; No. 11, 156, 245, 248-9; No. 15, 245; No. 81, 275; *Protection* (Schutzstaffeln), 252*n.*

Squadrons, Bombing (Bombengeschwader), No. 1, 100; No. 3, 98-9, 100*n.*, 197

German Army, *see* 'Army (German)'

German Offensive, 1918:

Somme, First Battles of (21 Mar.-5 Apr. 1918), 260-353; General situation, 260-1; British defensive measures, 261-2; reorganization of British infantry divisions, 262-3; extension of British line, 263-4; *R.F.C. in Defence*, 263, 277, 286, 359*n.*, App. xiv; German plans, 264*n.*-5; Fifth Army Conference (3 Feb.).—Gen. Gough's views, 265; Army Commanders' conferences at Doullens (16 and 21 Feb., 2 Mar.).—Sir D. Haig's appreciation of the situation, 266-8; R.F.C. Brigade Commanders conference (24 Feb.), 267; Air reports during German preparations, 268-71; British strategic plan, 270-1; British air concentrations, 271-3, App. xv; Relative strength of British and German Flying Services, 273, App. xvi; German air preparations, 273-6; air operations before the battle, 277-90; Opening of the offensive, 292-303; front of attack, 292; R.F.C. scheme of co-operation,

German Offensive, 1918—*continued*

290-2; weather conditions, 292-3; German advance (21 Mar.-5 Apr.), 290-353; Sir Douglas Haig's special order of the day, 314*n.*; French take over command of front S. of Somme (25 Mar.), 319; concentration of aircraft in Baupaume area, 323, 362; 'Carey's Force', 325-6; the gap at Roye, concentration of aircraft, 326-7; British and French plans for retirement, 328; Inter-Allied conferences at Doullens and Compiègne (25 and 26 Mar.), 328; General Foch appointed to co-ordinate efforts of British and French Armies, 327-8; Modification of German plans, 331; German attacks at Arras, 336-7; Fifth Army disbanded, 340; Gen. Foch's air instructions, 348-9; relative strength of British, French, and German Flying Services (2 Apr.), 349-50; change in British and German air tactics, 351-2; British aerodrome and supply organization, 353-8; R.F.C. work summarized, 358-363; German Air Service, comments on, 363-5; German attack at Villers-Bretonneux (24 Apr.), 387-8; losses in British aeroplanes and equipment, 402-3

Lys, the battles of (9-29 Apr. 1918), 366-400; Ludendorf's decision to transfer offensive to the Lys, 366; air reports of German movements, 366-9; views of G.H.Q., 367; R.A.F. squadrons, dispositions of, 371-2, App. xix; weather conditions on opening day, 374-5; the battle opens (9 Apr. 1918), 374-6; Portuguese retirement, 374-5; German attacks on Second Army (10 Apr. 1918), 377-8; the critical situation on 12 April 1918: Sir D. Haig's 'backs to the wall' order, 380; concentration of air effort, 380; the capture of Kemmel Hill (25 Apr. 1918), 397-9; aircraft supply and repair difficulties, 400-2; British losses in aircraft and

material, 402-3; German Air Service, comments on, by Gen. von Hoepfner, 403-4

Air Offensive, policy, 286, 344, 348, 351-2, 362, 364, 371-4, 377-80, 383-4, 399, App. xiv

Allocation of duties of R.A.F. squadrons, 371-3, 377-8, 380-1, 383, 398-9, App. xix

Artillery Co-operation (Aeroplane), *British*, 272-3, 278, 294, 300*n.*, 309-10, 315, 319-20, 331, 337, 339, 343, 358-61, 369, 373, 382, 386-7, 398-400; *German*, 403-4

Balloons: *British*, 278, 315*n.*, 337, 356, 373, 382, App. xv; *German*, 284-5, 384-5; attacked, 385; App. xiii

Bombing policy and programmes, 272, 277-9, 280-6, 290, 312, 322-4, 328-30, 335-6, 341, 343, 347-9, 373, 380, 381*n.*, Apps. xiv, xviii

Bombing attacks: *British*, 280-6, 296-7, 304, 306, 311-13, 317*n.*, 318, 321-7, 328-32, 335-8, 341-7, 350, 372-3, 376, 379, 383-7, 388, 397-8; *German*, 306, 318, 330, 345, 356, 363-4, 401-2, App. xiii

Contact patrols, 272-3, 296, 302, 307, 309, 311, 326, 331, 338-9, 361, 375-8, 382, 386-8, 397-400; *German*, 376

Fighting in the air, 284-6, 287-92, 297-9, 304-6, 308, 310, 312-13, 317-18, 327, 330, 333-4, 336, 339-40, 343-6, 348-9, 351-2, 376-7, 379, 384, 386-7, 389-97, 398, 400, Apps. xiv, xvii, xviii

German Air Service: 269, 273-6, 277*n.*, 312, 317, 327, 336, 339-40, 345, 348, 349-50, 351-2, 363-5, 372, 379, 384, 388, 398, 400, 403-4, Apps. xiii, xvi

Low-flying attacks by aeroplanes: *British*, 278, 280, 291-2, 295-6, 299-304, 306-8, 310, 315-16, 320-7, 329-30, 331-9, 341-5, 347-9, 352-3, 361-4, 372-3, 375-81, 383-4, 386-8, 398-9, App. xiv; *German*, 275, 297, 302, 305, 327, 339, 363-5, 377, 384, 398, 400, App. xiii

Patrols: *Offensive*, 277-8, 285-92, 298-9, 305, 312, 327, 343-4, 351-2,

- German Offensive, 1918—*continued*
 364, 384, 389, App. xiv; *Line*, 294, 296
 Photography, air, 264, 267-70, 278, 283, 288, 290, 367-9, 374, 378, 381, 382*n.*, 385, 389-90, Apps. xiii, xiv
 Reconnaissances, air: *British*, 263-4, 268-9, 281, 283, 293-5, 302-4, 306, 313-14, 319-20, 337, 343, 345, 348*n.*, 352, 361, 366-70, 373-4, 378, 381*n.*, 382, 385-7, 398; Apps. xiii, xiv; *German*, 384
 Gerrard, Wing Commr. E. L., 48
 Gheluveld, 210
 Gheluwe, bombed, 188, 191*n.*, 397, 398*n.*
 Ghent, bombed, 95, 101
 Ghisteltes, Ger. aerodrome, bombed, 80, 96
 Gibraltar, 53, 59
Glorious, Br. L.Cr., 9*n.*, 11, 26, 28, 31, 37
 Goble, Sqdn. Commr. S. J., 297*n.*
 Gontrode, Ger. aerodrome, 98; bombed, 99, 190, 194, 197-8, 211*n.*
 Goody, A. W., 20
 Gosport, 200
 Gough, Gen. Sir Hubert De la P., 139, 173, 264-5, 301, 303, 325-6, 340; *The Fifth Army*, 168*n.*, 265*n.*, 319*n.*
 Gowan, Lt.-Commr. C. H. B., 29
 Graham, Flt. Commr. R., 71, 90
 Grain, Isle of, Experimental Aircraft Depot at, 13, 23, 35
 Grand Fleet, *see* 'Fleet'
 Grant, Maj.-Gen. P. G., 325
Greyhound, Br. S.S., 80
 Griggs, Lt. A., 246
 Grosskreutz, Maj., 'The Battle of the Tanks at Cambrai', in *Die Luftwacht*, 244*n.*
 Ground targets, attacks on from the air, *see* 'Low flying'
 Groves, Wing Capt. R. M., 24
 Guines, aeroplane supply depot, 100, 401-2
 Guise, bombed, 282
 Gun mountings, Foster, 200
 Haig, Field-Marshal Sir Douglas: 34; and the R.N.A.S. units in Belgium, 103; plans to clear the Belgian coast, 109, 110; and withdrawal of aircraft for home defence, 134, 152-4, 158*n.*, 166-9; on publication of names of pilots, 201; on Passchendaele, 204, 207; plans for battle of Cambrai, 227-9, 241; decides to renew attack for Bourlon ridge, 242-3, 249; abandons Bourlon position, 256; policy of defence (Mar. 1918), 262-3, 266, 270-1; Special Orders of the day (24 Mar. 1918), 314*n.*, (12 Apr. 1918), 380, 327-8
Halcyon, 22
 Halsey, Cmdre. L., 3*n.*
 Ham, 303, 305; bombed, 329, 330
 Hammond, Lt. A. W., 334
 Hampton Roads, 59
 Handley Page aeroplanes, *see* 'Aeroplanes, types'
 Hanning, Lt. J. E., 294
 Harlebeke, aerodrome, bombed, 211*n.*
 Harrison, Lt. W. L., 333
 Harwich, bombed, 98, 99
 Harwich Command, 24*n.*
 Harwich Force, 24, 78, 85
Haslingden, Br. S.S., 58
 Haubourdin, bombed, 311, 373, 379, 384
 Havrincourt, 143
 Hawker, Maj. L. G., 395
 Hebuterne, 331
 Heligoland, German seaplane base at, 14*n.*
 Heligoland, Bight of, 5; mining of, 14, 20, 26, 36, 74
 Hellemmes, station bombed, 385
 Hendon, catapult experiments at, 23
 Henin-Liétard, bombed, 344
Hermes, Br. aircraft carrier, 9*n.*, 14, 37
 Herseaux, Ger. aerodrome, bombed, 186*n.*
 Heule, Ger. aerodrome, 156; bombed, 162, 164, 178, 186, 209
 Higgins, Brig.-Gen. J. F. A., 143
 High Sea Fleet, *see* 'Fleet'
 Hill 70 (Loos), attack on, 169-72
 Hindenburg, Field Marshal von, and submarine warfare, 2; *Out of My Life*, 225*n.*, 264*n.*
 Hindenburg line, 229, 234
 Hirson, bombed, 283
 Hispano-Suiza, *see* 'Engines'
 Hobbs, Flt. Lt. B. D., 20, 66*n.*, 67

- Hoboken, Cockerill Works, bombed, 101
- Hoepfner, Gen. von, 113*n.*; *Deutschlands Krieg in der Luft*, 232*n.*, 273, 274*n.*, 276*n.*, 365, 385*n.*, 403-4
- Holle Bosch, bombed, 133
- Hollweg, Dr. von Bethmann, 2
- Holmes, Commr. G. R. A., 8-9, 36
- Holt, Lt.-Col. F. V., 207, 291
- Holtzendorff, Ad. von, 2
- Honnecourt, bombed, 297
- Hooglede, bombed, 186, 190, 194, 209
- Hope-Vere, Flt.-Lt. R. J. J., 24
- Hopkins, C. J. W., 37*n.*
- Horn Reefs, mine-sweeping operations off, 26
- Horne, Gen. Sir H. S., 380
- Hornsea, 77
- Houthem, bombed, 178
- Houton Bay, naval air station, 43, 68, 77
- Howden air station, 41, 60, 76
- Hughes, Air Mechanic E. E., 64
- Hughes, Capt. G. F., 289
- Humbert, Gen., 319
- Hustwitt, Lt. S. A., 388
- Hutier, Gen. von, 265
- Huxley, Lt. F. G., 246
- Hythe, 76
- Immingham, balloon base, 64, 76
- Independent Air Force, 198*n.*
- Indomitable*, Br. B.Cr., fitted with turret platform, 31
- Infantry co-operation, *see* 'Contact patrol'
- Inflexible*, Br. B.Cr., fitted with turret platform, 31
- Ingelmunster, bombed, 123, 124, 162, 176-7, 178, 208, 211*n.*
- Ingledeu, Air Mechanic A. E., 69
- Iron Duke*, Br. B., 3
- Iseghem, bombed, 123, 211*n.*, 313
- Jagdstaffeln*, *see* 'German Air Service'
- Jagow, Herr von, 2
- James, Maj. A. W. H., 272, 354
- Jellicoe, Ad. Sir John, and restriction of movement of Grand Fleet, 1; his views on anti-submarine measures, 2-3; appointed First Sea Lord, 3-4; and aircraft carriers, 9, 30; views on utility of aircraft in anti-submarine operations, 46; and North Sea barrage, 67; *The Grand Fleet 1914-1916*, 3*n.*
- Jochim, Oberst a-D., *Luftstreitkräfte*, 277*n.*
- Joseph, Lt. W. E., 310
- Jutland, battle of, 1, 9
- Kaiserslautern, bombed, 284
- Kankakee*, S.S., sunk, 57
- Kemmel Hill, attack on, 386; loss of, 397-400
- Killingholme, seaplane station, 19, 77
- Kingsnorth, airship station, 40*n.*, 76
- Kirkwall, 6*n.*
- Kite Balloons, *see* 'Balloons'
- Knocke battery, 83
- Kriegsspiele*, Ger. war exercises, 276
- Kruiseik, bombed, 191*n.*
- La Bassée, bombed, 172
- La Brugeoise works (Bruges), electric generating station, 105; weight of bombs dropped on (1917), 106
- La Gorgue, bombed, 379; aerodrome, 375, 376*n.*
- Laira, sub-airship station, 76
- Lambe, Wing Capt. C. L., 69; suggests substitution of aeroplanes for seaplanes (Dunkirk), 70, 73; and aeroplanes for anti-U-boat patrols, 74
- Landrecies station, bombed, 316
- Langemarck, battle of, 172-9. *See also* 'Ypres, battles of'
- La Panne, 81
- 'Large Americas', *see* 'Seaplanes'
- Larne, airship station, 76
- Larne-Stranraer traffic route, airship escorts on, 60, 76*n.*
- Lateau Wood, 234-5
- Laurence, Flt. Lt. C., 70
- Laventie, bombed, 379
- Lawrence, Lt.-Gen. H. A., 224
- Laycock, Air Mechanic J. R., 20
- Leacroft, Capt. J., 333
- Le Cateau, bombed, 296, 304, 312
- Le Catelet bridge, bombed, 297
- Leckie, Flt. Sub-Lt. R., 20
- Le Courier de l'Air*, 221
- Ledeghem, bombed, 186-8, 206
- Lee, Sqdn. Ldr. A. S. G., 236-7
- Le Hameau aerodrome, 282, 329, 336

- Leighton, 2nd Lt. W. H., 294
 Lens Junction, bombed, 331
 Le Rhone engines, *see* 'Engines'
 Lestrem, bombed, 379
 Le Transloy, bombed, 345
 Lewis, Capt. G. H., 333
 Lewis, 2nd Lt. T. A. M. S., 121
 Liberty, American journal, 392*n*.
 Lichtervelde, Ger. aerodrome, bombed,
 190; station bombed, 178, 209
 Liettres aerodrome, 376*n*.
 Light cruisers, *see* 'Cruisers'
 Lille station, bombed, 178, 312, 331,
 385
 Lillers, bombed, 364
 Lion, Br. B.Cr., fitted with turret plat-
 form, 31
 List (Sylt), German seaplane base, 14*n*.
 Llewellyn, Br. destroyer, 80
 Lombartzyde, German attack at, 146-
 52. *See also* 'Ypres, battles of'
 London, bombed, 66, 98, 99, 101; in-
 fluence of on R.F.C. in the Field,
 134, 152-5
 London Colney, 200
 Longcroft, Brig.-Gen. C. A. H., 140
 Longside air station, 6*n*., 40*n*., 41, 60,
 68, 76
 Longueau, bombed, 318, 364
 Loos, Hill 70, battle of (15 Aug.), 169-
 72; counter attack patrol scheme,
 170-2
 Loucheur, M., 328*n*.
 Low-flying attacks by aeroplanes:
 British: during *battle of Messines*,
 129-30, 135; during *battles of*
 Ypres (1917), 95, 161, 163-6, 175-
 8, 179, 180, 181*n*., 184, 185, 188,
 191, 193-4, 204, 206, 208-12,
 Apps. vi, vii, viii; during *battle of*
 Cambrai, 230-9, 243, 245-7, 251,
 253-4, 255, 256-7, App. xi; during
 German offensive (1918), 278, 280,
 291-2, 295-6, 299-304, 306-8,
 310, 315-16, 320-7, 329-30, 331-
 9, 341-5, 347-9, 352-3, 361-4,
 372-3, 375-81, 383-4, 386-8,
 398-9, App. xiv
 German: 135, 193, 241, 243-4, 250-
 5, 258-9, 275, 297, 302, 305, 327,
 339, 363-5, 377, 384, 398, 400,
 Apps. xii, xiii
 Lozinghem, *see* 'Auchel'
 Lowestoft, balloon base, 64*n*., 76
 Lucas, Leading Mechanic R. A., 73
 Luce Bay air station, 60, 76
 Ludendorff, Gen. von, and submarine
 warfare, 2, 312*n*., 331, 362, 366-9;
 My War Memories, 186*n*., 193, 203,
 257*n*., 264*n*., 270, 370*n*.; *Attack in*
 Position Warfare, 262, App. xiii
 Ludlow-Hewitt, Lt.-Col. E. R., 141;
 memorandum by, on artillery co-
 operation, 214-18
 Lundy Island, 45-6
 Lusk, Flt. Sub-Lt. C. E. S., 73
 Lys, river, bridges over, bombed, 379
 Lys, battles of, *see* 'German Offensive
 1918'
 M.23, Br. monitor, 88
 McCudden, Capt. J. T. B., 188-90,
 195, 200, 256; *Five Years in the*
 R.F.C., 396
 Macdonogh, Maj.-Gen. G. M. W., 221
 Mackenzie, Lt. W. J., 391
 Mackenzie, Flt.-Lt. W. R., 64
 McLeod, Lt. A. A., awarded V.C.,
 333-4
 Magor, Flt. Sub-Lt. N. A., 73
 Mainz, bombed, 284
 Malo-les-Bains, aeroplane repair-shops
 at, 101
 Mametz, bombed, 329
 Mannheim, projected bombing of, 153,
 153*n*.; bombed, 284
 Man-power, distribution of, 262, 263*n*.
 Manston air station, 65
Manxman, Br. aircraft carrier, 6-9, 15-
 16, 43
 Maps, tactical, 181*n*., 182; for use of
 R.F.C., during Ger. offensive, 290
 Marcke, Ger. aerodrome, 130, 156;
 bombed, 123, 162, 186, 190, 209,
 211*n*.
 Mariakerke, Ger. aerodrome, 198
 Maricourt, bombed, 329
 Marquaix, bombed, 311
 Marquion, bombed, 255, 322, 330
 Marquise, 401
 Marshal Ney, Br. monitor, 56
 Marshal Soult, Br. monitor, 83
 Masnières, 235, 255
 May, 2nd Lt. W. R., 391, 392*n*.
 Maybery, Lt. R. A., 163-5
 Melbourne, Australian L.Cr., 31

- Melle, bombed, 190
 Mellersh, Lt. F. J. W., 390, 392
Menelaus, Br. balloon ship, 10; later ammunition carrier, 111.
 Menin, bombed, 124, 132, 179, 186-8, 191*n.*, 209, 346
 Menin Road Ridge, battle of, 180-90.
See also 'Ypres, battles of'
 Merckem peninsula, 210
 Merifield (Devonport), balloon station, 76
 Merris, 386
 Merville, 378, 381-3, 386, 401; bombed, 380, 383
 Messines, 377-8
 Messines, battle of:
 Allied Conference (4/5 May 1917) at Paris, decision of, 109; Importance of Belgian coast, 109; General plans, 109-10; British and German troops engaged, front of attack and objectives, 110; German defences, 110; British air concentration, 111-12, App. iii; British and German strength in aircraft, 112; Artillery concentration, 113; Duties of the R.F.C., 113-14; Importance of air co-operation with artillery, 114; Scheme for air offensive, 114-15; Wireless interception organization, 115-18; German system of wireless warnings, 117; Opening of the bombardment, 118; Counter-battery work, 119; rehearsal of artillery barrage, 124-5; the attack opens, 125; explosion of mines, 125; Infantry advance, 127-8; consolidation, 133; German counter-attack, 133; German retirement, 134; lessons of the battle, 135-7
 Air Offensive, policy, 114-16; wireless interception scheme, 116-20
 Allocation of duties of R.F.C., 111-12, App. iii
 Artillery Co-operation (aeroplane), *British*, 113-14, 116, 118-19, 124-5, 127-8, 130-1, 136-7; *German*, 117, 119-20, 135
 Balloons: *British*, 118, 127-8, 135; *German*, 114-15
 Bombing programme, 122
 Bombing attacks: *British*, 122-4, 125, 131-3, 134; *German*, 125, 134, 135
 Contact patrols, 115*n.*, 118, 125-8, 133
 Fighting in the air, 119-21, 123, 129, 132-3, 134
 German Air Service, 132-5
 Low-flying attacks by aeroplanes: *British*, 129-30, 135; *German*, 135
 Patrols: *Offensive*, 118, 132; *Line*, 114-15, 118
 Photography, 118-20, 124, 132
 Reconnaissances, Air, 120, 122, 132-3
 Meteren, 386
Michael Attack, 264*n.*
 Milford Haven, 46, 59, 64*n.*, 76
 Milford Haven Group of aircraft stations, 48*n.*
Militärstrafgesetzbuch, 220, 222
 Mills, Lt.-Col. R. P., 141
 Milner, Lord, 328
 Mining operations:
 (British) *Naval*: North Sea, 5, 14-16, 26; off Belgian coast, 86-9; *Military*, at battle of Messines, 125
 (German) *Naval*, 44, 54*n.*
 Monchy, bombed, 322
 Monitors, *see Erebus*, M.23, *Marshal Ney*, *Marshal Soult*, *Terror*
 Mons, bombed, 283
 Mons-en-Chaussée aerodrome, 297*n.*, 301; bombed, 322
 Montbrehain, bombed, 281
 Mont d'Origny, Ger. aerodrome, bombed, 281-2
 Montdidier, loss of, 335
 Moore, Flt. Commr. W. S., 26
 Moorslede, bombed, 194
 Moorseele, aerodrome bombed, 209, 211*n.*
 Morris, Major E. N. G., 105
 Mortimer, Air Mechanic J. A., 66*n.*
 Mory, bombed, 350
 Moser, Gen. von, *Feldzugsaufzeichnungen*, 147
 Mossop, Flt. Sub-Lt. C. S., 69
 Motor-boats (British), coastal, 72, 80-1
 Motor-boats (German), *see Fernlenkboot*
 Motteville, 402

- Mouveaux, Ger. aerodrome, bombed, 178
 Mullion, air station, 45-8, 60-1, 76-7
Nairana, Br. aircraft carrier, 13, 14, 32, 43
 Nancy, 283-4
 Narbeth, J. H., 9n., 37
 Netherland Legation, 222
 Neuf Berquin, bombed, 380, 383-4, 387
 Neumann, *In der Luft unbesiegt*, 232n.
 Neuve Chapelle, bombed, 379
 Neuville, bombed, 248
 Newall, Lt.-Col. C. L. N., 198n.
 Newbolt, Sir Henry, *Naval Operations*, 59n.
 Newhaven, aircraft sub-station, 48, 76
 Newlyn, aircraft station, 46, 48, 76
 New York, as port of assembly for ocean convoys, 59
New Zealand, Br. B.Cr., 31
 Nicholson, Capt. Wilmot S., 13, 36, 37n.
 Nicol, Air Mechanic E. M., 66n.
 Nieppe, 378
 Nieuport, 93; Sector, taken over by British, 138
 Night flying, development of, 196-8
 Nivelles, Gen., 109
 Norderney, German seaplane base, 14n.
 North Goodwin Drifter Division, German seaplane attacks on, 56
 North Queensferry (Rosyth), kite balloon station, 76
 North Sea, Ad. Scheer's sorties, 1, 2; air reconnaissance over, 6; Barrage, 67-8
North Star, Br. destroyer, 88
Nottingham, Br. L.Cr., torpedoed, 1
Nugent, Br. destroyer, 89
 Nurlu, 307
Nyanza, Br. S.S., 56
 Ocean convoys, 59-63. *See* 'Submarines, German, measures against'
 Ochey, bombing wing established in area of, 101, 198n.
 Offensive, German, *see* 'German offensive'
 Oignies, bombed, 169, 170
 Oliver, Capt. D. H., 294
 Oliver, Vice-Ad. Sir H. F., 30n.
 Olivier, 2nd Lt. E., 212
 Omignon, river, French extend their front northwards to, 139, 143
 Oosttaverne, 128; defence line, 110, 127, 128, 130, 131
 Oostnieuwkerke, bombed, 191n.
 Operations Committee of Board of Admiralty, *see* 'Admiralty'
 Oppy, bombed, 347
 Orders of Battle (R.F.C.): Messines, App. iii; Ypres 1917, App. v; Cambrai, App. x; German offensive 1918, App. xv
 Orkney Islands, 77
 Orlebar, Capt. A. H., 305-6
 Ostend: German destroyer and U-boat base, 47, 78, 103; seaplane base at, *Flanders II*, 15n., 69-73; German destroyer raids from, 80-1; dockyard at, bombarded (5 June 1917), 85-6; again bombarded (Sept. and Oct. 1917), 89-90, 97; importance of as naval bombing target, 105-6; bombed, 81-2; weight of bombs dropped on (1917), 106
 Ostricourt station, bombed, 331
 Owen, Lt. G. W., 310
 Owen, Lt. R. J., 317
 'P' boats, for North Sea Barrage, 68
 Padstow, naval aeroplane station, 77
 Paine, Cmdre. G. M., 4n., 13, 30n.
 Paine, Flt. Sub-Lt. L. P., 71
Paragon, Br. destroyer, loss of, 80
 Paris, German air raids on—Counter measures, 279-83
 Parks, Reserve Lorry, 353n.
 Passchendaele, battles of, 205. *See* 'Ypres, battles of'
 Pascoe, 2nd Lt. F. L., 339
Patriot, Br. kite balloon-carrying destroyer and destruction of *U.69*, 63-4
 Patrols:
 Anti-submarine (air): Home Waters, 46-7, 48-50, 52-5, 59-60, 64-7, 76-7; off *French and Belgian coast*, 68-74, 102
 Barrage: North Sea, 68; off *Belgian coast*, 86-8, 92-3
 Contact, *see* 'Contact Patrols'
 Counter-attack (British), during

Patrols—continued

- battles of Ypres (1917)*, 170-2 (Hill 70), 173-5, 182-8, 192-3, 203-5, 206, 210
- Line*, during *battle of Messines*, 114-15, 118; during *German Offensive (1918)*, 294, 296.
- Offensive*, during *Belgian coast operations*, 85, 93, 96, 98; during *battle of Messines*, 118, 132; during *battles of Ypres (1917)*, 144, 158-9, 175-6, 178, 194, 210-11, Apps. vii, viii; during *battle of Cambrai*, 232, 254, 258, App. ix; during *German offensive (1918)*, 277-8, 285-92, 298-9, 305, 312, 327, 343-4, 351-2, 364, 384, 389, App. xiv
- Pegasus* (formerly *Stockbolme*), Br. aircraft carrier, 13; fitted to carry fighter aeroplanes, 32, 43
- Pembroke, air station, 45-7, 48, 76
- Penny, Flt. Commr. R. E., 23
- Péronne, 303, 307, 322, 363; bombed, 324, 329, 336, 338, 346
- Pétain, Gen., 109, 327-8
- Peterhead, aircraft station, 68*n*.
- Petite Synthe: Br. aerodrome, 81*n*.
- Phaeton*, Br. L.Cr., and airship refueling, 42
- Phalempin, Ger. aerodrome, bombed, 170
- Phillimore, Rear-Adm. R. F., 24, 29*n*.; appointed Rear-Admiral for Air, 34, 36
- Photography, air: *Belgian coast*, 79, 81-2, 84; Survey of landing beaches, 90-2, 102-3; during *battle of Messines*, 118-20, 124, 132; during *battles of Ypres (1917)*, 190, 202, 207-8, 210; during *battle of Cambrai*, 256; during *German offensive (1918)*, 264, 267-70, 278, 283, 288, 290, 367-9, 374, 378, 381, 382*n*., 385, 389-90, Apps. xiii, xiv
- Pigeons, in naval aircraft, 71, 72
- 'Pill-boxes', 173
- Pitcher, Brig.-Gen. D. le G., 371, 380
- Plumer, Gen. Sir H. C. O., 110, 180; views on air bombing, 318*n*.
- Poelcappelle, 202-5. See 'Ypres, battles of'
- Poincaré, M., 328*n*.
- Pola, 47

- Polegate, airship station, 48, 76
- Pollak, Capt. E. R. H., 339
- Polygon Wood, battle of, 190-6. See 'Ypres, battles of'
- Pont Rade, bombed, 248
- Popkin, Sgt. C. B., 392
- Porte, Wing Commr. J. C., 16, 18, 65
- Porte flying-boat, see 'Seaplanes'
- Portland, naval air station, 48, 76
- Portsmouth Group of air stations, 48
- Portuguese Corps, see 'Army, Portuguese'
- Potvin, Flt. Sub-Lt. J. E., 71
- Pozières, ammunition dump, bombed, 324
- Prawle Point, naval air station, 47, 77
- Prémont, Ger. ammunition dump, bombed, 281
- Prince, Br. L.Cr., 25
- Princess Royal*, Br. B.Cr., 31
- Propaganda, dropping of pamphlets from aircraft, 219-26
- Provin, station bombed, 330
- Pulham, air station, 40, 41, 62, 76
- Quesnoy, bombed, 124, 132, 383
- Quéant, station bombed, 317, 321
- Queenstown, 46, 59
- Quiéry-la-Motte, bombed, 341
- Railways, German, see 'Communications'
- Ramegnies Chin, Ger. aerodrome, bombed, 131
- Ramsgate, 56
- Rang du Fliers, 356-8
- Rathmullen (Lough Swilley), balloon base, 64
- Rawlinson, Gen. Sir H. S., 139, 140, 340, 361
- Reichsarchiv*, 273*n*.
- Reckem, Ger. aerodrome, bombed, 123, 130, 178
- Reconnaissances, air (British): *North Sea*, 6-10, 13-15, 19, 32, 36, 38-40, 42-4; (German) 5; during *Belgian coast operations*, 79, 81, 102; during *battle of Messines*, 120, 122, 132-3; during *battles of Ypres (1917)*, 144-5, 148-9, 162, 187, 190, 206-7, Apps. vi, vii, viii; during *battle of Cambrai*, 239-40, 243, 248, 251-2, 255, 259, Apps. ix, xi; during *German offensive*

Reconnaissances—*continued*

(1918), 263-4, 268-9, 281, 283, 293-5, 302-4, 306, 313-14, 319-20, 337, 343, 345, 348*n.*, 352, 361, 366-70, 373-4, 378, 381*n.*, 382, 385-7, 398, Apps. xiii, xiv (German), 384. *See also* 'Photography, air'

Redcar, air station, 65, 77

Repulse, Br. B.Cr., 30, 31, 34, 38

Renown, Br. B.Cr., 31

Rhys-Davids, Lt. A. P. F., 188-9, 210-11, 396

Richthofen, Leutnant Lothar von, 289

Richthofen, Freiherr Manfred von, 134, 141-2, 289, 334*n.*, 389-93; biography of, 394-7

Richthofen's 'Circus', 156, 245, 248-9, 285, 289, 389-93

Rieux, bombed, 248*n.*

Riviera, Br. aircraft carrier, 8, 73

Robertson, 2nd Lt. A. E., 332

Robertson, Gen. Sir W. R., 152-4, 201

Rogers, Lt. T., R.N.V.R., 71

Roisel, bombed, 311, 317

Rolls-Royce, *see* 'Engines'

Rosendaal, 101

Rosières-en-Santerre, bombed, 346, 388

Rosyth, naval air base, 14, 24, 34, 43, 64*n.*, 77

Roulers, bombed, 178, 179, 187-8, 194, 209, 210*n.*, 250, 330

Royal Air Force: formed, 346*n.*; casualties, *see* 'Casualties'; Gen. Foch's instructions to, 348-9, 351, App. xviii; brigade strength in squadrons (9 Apr. 1918), App. xix; statistics of work of, 381*n.*, 382*n.*; wastage in aircraft and equipment (Apr. 1918), 403-4

Royal Flying Corps:

Strength: at Messines, 111

Tactical employment of, Memorandum by General Staff, 166-9

Publicity, question of, 201

Statistical summary of work of (Sept. 1917), 201-2

at battle of Cambrai, 230*n.*

Comments on work of, at Cambrai, 256-9

German offensive 1918, 273, 402, App. xvi

Employment of in Defence, Memorandum on, 263, 277, 286, 359*n.*, App. xiv

Size of fighting formations, 286-7, App. xvii

Supply organization during German offensive, 353-8

Wastage in aeroplanes and equipment (Mar.-Apr. 1918), 402-3

Casualties, *see* 'Casualties'

Order of Battle, Messines, App. iii; Ypres, App. v; Cambrai, App. x; German offensive 1918, App. xv. *See also* 'Messines', 'Ypres', 'Cambrai', 'battles of and German Offensive, 1918'

Royal Naval Air Service:

Policy and development of with the Fleet, 5-14, 23-4, 25-8, 30-44, App. i; action against German airships in North Sea, 19-22, 24-5; and U-boat warfare, 45-77; in Belgian coast operations, 77-108. *See also* 'Fleet, Grand', 'Submarine, German, measures against', and 'Belgian Coast'

Roye, bombed, 346

Rumbeke, Ger. aerodrome, bombed, 131, 176-8, 186, 193-4, 207, 209, 211*n.*

Rutland, Sqdn. Commr. F. J., 6, 15, 24, 36

Sailly, bombed, 248*n.*

St. André-aux-Bois, No. 2 Aeroplane Supply Depot, 355-6

St. Denis Westrem, Ger. aerodrome, 98; bombed, 99, 122, 197-8

St. Léger, bombed, 350

St. Omer, No. 1 Aircraft Depot, 400-2

St. Pol, 73, 81, 82; R.N.A.S. aircraft depot at, bombed, 99-100; destruction of, 106

St. Quentin, 268*n.*, 269; canal bridges bombed, 282, 297, 304, 317, 331

Salcombe, 46. *See also* 'Prawle Point'

Salmond, Maj.-Gen. J. M., 225; appointed to command R.F.C. in France, 266; 267, 320, 321*n.*, 323, 330, 353, 371

Santa Elena, German aircraft carrier, 15*n.*

Satchell, Lt. H. L., 121

Saultain, Ger. aerodrome, bombed, 283

- Sawden, Lt. W. W., 121
 Scapa Flow, 14, 26, 34, 64*n.*, 77
 Schaefer, Lt. Karl, 121
 Scheer, Admiral, 1-2, 5; *Germany's High Sea Fleet in the World War*, cited, 1, 15*n.*, 20*n.*
 Schleswig coast, 5
 Scholtz, 2nd Lt. E., 219-20, 223-4
 Schwarte, Generalleutnant Max, *Der Grosse Krieg*, 370*n.*
 Scilly Isles, flying-boat operations from, 45, 47-8, 68, 76
 Scott, Lt. F. J., 332
 Seaplanes (British):
 Flying Boats, for North Sea reconnaissance, 1, 6, 42; use of against Zeppelin airships, 19-21; co-operation with the D.H.4 aeroplane, 21-2; development of, 16-19; in anti-submarine operations, 47, 52; '*Spider Web*' patrol, 53-4, 54-5, 61, 64-8, 73-6
 Float: Sopwith 'Schneider Cup' type carried in Submarine *E.22*, 24*n.*; superseded by aeroplanes for Fleet work, 43; in anti-submarine operations, 68-73; co-operation with coastal motor-boat attack on German destroyers (Zeebrugge), 80-1
 Types:
 Boat: Curtiss America, 16; F.1 (Felixstowe), 18; Fairey, used for catapult experiments, 23; F.2a, 18; F.3, 19, 65; H.4 (*Small America*), 17, 18; H.8 (*Large America*), 17; H.12 (*Large America*), 17-22, 55, 66; Porte flying-boat, 17, 67
 Float: Sopwith 'Baby', 6-7, 70-3; Short, 70-3; Wight, 68-9
 See also 'Belgian Coast', 'Fleet, Grand', and 'Submarines, German, Measures against'
 German: torpedo-carrying, attacks on shipping by, 55-8, 71-2, 84, 85, 89, 90. *See also* 'German Air Service'
 Seaton Carew, seaplane station, 77
 Seboncourt, Ger. aerodrome, bombed, 281
 Seclin, bombed, 178, 187
 Sensée, river, 241-2
 Serny aerodrome, 375, 376*n.*
 Sharpe, Capt. T. S., 305
 Sheerness, balloon base, 64*n.*
 Shetland Islands, 77
 Shipping, Allied: number of vessels sunk, 47; protection against torpedo aircraft attacks, 57
 Shotley, balloon base, 64, 76
Simoon, Br. destroyer, loss of, 79
 Slatter, Flt. Sub-Lt. L. H., 90
Slinger, Br. steam hopper, used for catapult experiments, 23
 Slyken (Ostend), electric generating station, 105
 'Small Americas', *see* 'Seaplanes (boat)'
 Smart, Flt.-Lt. B. A., 25-6
 Smith, Lt. N. A., 388
 Smoke Screen, German, *see* 'Belgian Coast'
 Smoogroo, naval aeroplane station, 34, 77
 Smythies, Maj. B. E., 237
 Solway works (Zeebrugge), electric generating station, 105
 Somain, station bombed, 242*n.*, 247, 283
 Somme bridges and roads, bombed, 318, 327
 Somme, the, first battles of 1918 (21 Mar.-5 Apr. 1918), *see* 'German Offensive 1918'
 Sound ranging, 151-2
 Southampton, Br. L.Cr., 31
 South Shields, seaplane station, 77
 Southwold, 56
 Spaight, J. M., *Air Power and War Rights*, 221*n.*
 Sparappelhoek, Ger. aerodrome, bombed, 96-8, 186*n.*
Spider-Web patrol, the, 53-5. *See also* 'Submarines, measures against'
 Spikings, Air Mechanic C., 67
 Spotting, aircraft, for H.M. ships, 14, 38, 81; at bombardment of Zeebrugge and Ostend, 83, 84, 85, 89
 Squadrons (*R.F.C. and R.A.F.*):
 Establishment (Corps), reduced after battle of Arras, 111*n.*; duties after beginning of German offensive, 290-2; hours flown by (12 Apr. 1918), 382*n.*; wastage in aeroplanes and material (Mar.-Apr. 1918), 402-3; casualties, *see*

Squadrons—*continued*

- 'Casualties'; Bomber: diversion of to low attacks, 320-1, 362; return to upper air (31 Mar. 1918), 343-4; Corps: bombing by, 286, 286*n.*; use of for low-flying attacks on ground targets, 338; used for day and night bombing (30 Mar. 1918), 341-2; diversion of, to low-flying attacks, effects of, 361; fighter: size of formations, 286-7, App. xvii; diversion of, to low-flying attacks, 362; return to upper air (31 Mar. 1918), 343-4
- Australian Flying Corps:*
- No. 2* (formerly *No. 68*, R.F.C.), 239*n.*, 299, 312, 324*n.*, 337, 342, 372
- No. 3* (formerly *No. 69*, R.F.C.), 239*n.*, 388-90
- No. 4* (formerly *No. 71*, R.F.C.), 239*n.*, 299, 308, 312, 324*n.*, 332, 337, 347, 371, 373, 376, 378
- R.F.C. and R.A.F.:*
- No. 1*, 111, 125, 130, 181*n.*, 205, 323-4, 332, 337, 378, 378*n.*, 383, 398
- No. 2*, 79, 82, 306, 320*n.*, 333-4, 341, 345, 350, 372, 379
- No. 3*, 212, 233-4, 236-7, 243, 245-6, 252-3, 292, 307, 324
- No. 4*, 140, 140*n.*, 174, 180*n.*, 181*n.*, 306, 320*n.*, 345, 350, 372, 375, 376*n.*
- No. 5*, 320*n.*, 341, 345, 387
- No. 6*, 111, 132, 180*n.*, 181*n.*, 272, 272*n.*, 350*n.*, 354, 387
- No. 7*, 111, 131, 140, 140*n.*, 174-5, 180*n.*, 181*n.*
- No. 8*, 298, 300*n.*, 314, 319, 324*n.*, 360
- No. 9*, 140, 140*n.*, 159-60, 174, 174*n.*, 180*n.*, 181*n.*, 205
- No. 10*, 169-70
- No. 11*, 195, 219, 248, 255, 298, 324*n.*, 395
- No. 12*, 295, 324*n.*
- No. 13*, 323-4
- No. 15*, 255, 313, 324*n.*
- No. 16*, 171-2, 306, 320*n.*, 330, 345
- No. 18*, 179-80, 247, 299, 312, 324-5, 337, 344, 346-7, 371, 373, 376*n.*, 378-9, 381*n.*, 382*n.*, 383
- No. 19*, 111, 121, 130, 135, 135*n.*, 163, 177, 178*n.*, 181*n.*, 199*n.*, 212, 323-4, 332, 371, 378*n.*
- No. 20*, 111, 121, 132, 142*n.*, 157, 181*n.*, 323-4, 332, 378*n.*
- No. 21*, 111, 131, 140, 140*n.*, 174-5, 180*n.*, 181
- No. 22*, 178*n.*, 181*n.*, 221-2, 299, 312, 312*n.*, 324, 327, 371-2, 382*n.*
- No. 23*, 112, 140, 176-7, 181*n.*, 208, 284, 292, 296, 298, 311, 326, 342, 345
- No. 24*, 179-80, 284, 288, 291-2, 296, 298, 303-4, 311, 326-7, 339, 342, 345
- No. 25*, 132, 170, 172, 186*n.*, 209, 210*n.*, 247-8, 250, 266, 271, 272*n.*, 283, 288-9, 296, 298, 312, 316, 320, 324, 332, 338, 341-2, 344, 346-7, 372, 379, 385
- No. 27*, 111, 122-3, 132-3, 162, 170, 172, 178, 181*n.*, 186, 190, 194, 197, 247-8, 250, 271, 272*n.*, 283, 288-9, 296, 298, 304, 312, 316-17, 320, 324, 338, 341-2, 344, 347, 372, 379, 385
- No. 28*, 200, 207-8; arrival in France, 207*n.*; transferred to Italy, 208*n.*
- No. 29*, 140, 177, 181*n.*, 184, 378*n.*
- No. 32*, 140, 177, 181*n.*, 348, 372
- No. 34*, 141, 149
- No. 35*, 298, 300*n.*, 303-4, 310, 315, 316*n.*, 326, 338, 342, 388
- No. 40*, 112, 171, 299, 312, 324, 333-4, 337, 371, 373, 376, 378, 385
- No. 41*, 111, 130, 179-80, 195, 244, 254, 308, 324, 327, 350*n.*, 371-2
- No. 42*, 111, 125, 132-3, 180*n.*, 181, 320*n.*, 372, 376, 376*n.*
- No. 43*, 130, 132, 154*n.*, 170-1, 299, 312, 312*n.*, 317-18, 324, 327, 372, 384
- No. 45*, 111, 120, 181*n.*, 199, 209
- No. 46*, 94*n.*, 111, 121, 234, 236-7, 239, 243, 245, 292, 295, 300, 302, 307-8, 324*n.*, 372; withdrawn for home defence, 153-4
- No. 48*, 95, 97, 108, 141, 196, 266, 285, 288, 291, 298, 316*n.*, 326, 342, 345
- No. 49*, 230, 248, 248*n.*, 283, 304, 311, 317, 321, 324, 324*n.*
- No. 52*, 141, 147-51, 298, 326, 338, 339, 342

Squadrons—*continued*

- No. 53*, 111, 125, 180*n.*, 181 296, 296*n.*, 303-4
No. 54, 141, 285, 288, 291, 298, 316*n.*, 323-4, 326, 342, 345, 377*n.*, 398
No. 55, 111, 122-3, 131-3, 178, 181*n.*, 187, 190, 194, 197, 198*n.*
No. 56, 94*n.*, 111, 130, 158, 163, 178, 181*n.*, 188, 194, 198-201, 210, 298, 308, 324, 327, 396; withdrawn for Home Defence, 134-5, 135*n.*
No. 57, 140, 177-8, 181*n.*, 182, 190, 194, 205, 209, 210*n.*, 312, 323-5, 332, 337, 344, 346
No. 58, 272, 272*n.*, 306, 313, 322, 322*n.*, 324, 328-9, 336, 341, 345, 347, 350, 372-3, 379, 385, 387
No. 59, 255, 293-5, 308, 319-20, 324, 327
No. 60, 129, 180, 181*n.*, 312*n.*, 324, 327
No. 62, 271, 272*n.*, 289, 298, 305, 316*n.*, 320, 324, 372
No. 64, arrival in France, 235*n.*; 235-7, 243, 245-6, 253, 298, 324, 327, 372
No. 65, 342, 345, 351
No. 66, 94*n.*, 111, 130, 178, 181*n.*, 198; withdrawn for Home Defence, 135, 135*n.*
No. 68 (later *No. 2*, Australian), 239, 243, 245-6, 251, 253, *see No. 2* Sqdn. Australian Flying Corps
No. 69 (later *No. 3*, Australian), 239*n.*, *see No. 3* Sqdn. Australian Flying Corps
No. 70, 111, 122, 154*n.*, 178, 181*n.*, 184, 196, 199, 207-8, 324*n.*
No. 71 (later *No. 4*, Australian), 239*n.*, 299, *see No. 4* Sqdn. Australian Flying Corps
No. 73, 271, 272*n.*, 289, 305, 316*n.*, 324, 372
No. 74, 350*n.*, 398; arrival in France, 378*n.*
No. 79, 271, 272*n.*, 305, 324, 372
No. 80, 271, 272*n.*, 299, 305, 324, 372
No. 82, 298-9, 326, 338-9, 342-3
No. 83, arrival in France, 272; 272*n.*, 306, 322, 322*n.*, 324, 328, 336, 341, 345, 347, 350, 372, 379, 385, 387
No. 84, 244, 285, 288, 291, 296, 298, 303-4, 304*n.*, 311, 323-4, 326, 339, 342, 345, 351
No. 98, 378*n.*, 379, 383-4, 386, 397-8, 398*n.*; arrival in France, 379*n.*
No. 100, 112, 124, 132-3, 155-6, 178-9, 181, 181*n.*, 186-8, 191, 191*n.*, 194, 194*n.*, 196-7, 198*n.*, 284
No. 101, 181, 181*n.*, 186-8, 191, 191*n.*, 194, 194*n.*, 196-7, 208-9, 211, 211*n.*, 255, 272, 272*n.*, 279, 280-2, 306, 313, 318, 322, 326, 329-30, 336, 341, 344, 347, 350, 379, 385-6, 387-8
No. 102, arrival in France, 208*n.*; 208-9, 211, 211*n.*, 247, 255, 272, 272*n.*, 282, 306, 313, 318, 322, 324, 329, 336, 341, 345, 347, 350, 379, 385, 387
No. 201 (formerly *No. 1* R.N.A.S.), 382*n.*
No. 203 (formerly *No. 3* R.N.A.S.), 371, 376, 376*n.*, 378, 383*n.*
No. 205 (formerly *No. 5* R.N.A.S.), 346, 388
No. 206 (formerly *No. 6* R.N.A.S.), 346-7, 373, 378*n.*, 379, 382*n.*, 383-4, 386, 398
No. 208 (formerly *No. 8* R.N.A.S.), 371, 376*n.*; aeroplanes burned, 375
No. 209 (formerly *No. 9* R.N.A.S.), 346*n.*, 382*n.*, 389-93
No. 210 (formerly *No. 10* R.N.A.S.), 347, 371, 376, 376*n.*, 378, 385
No. 214 (formerly *No. 14* R.N.A.S.), 347, 385
No. 216 (formerly 'A' Bombing Squadron R.N.A.S.), 65, 284
R.N.A.S., 281*n.*; at Messines, 111*n.*, 121; squadrons renumbered on transfer to R.A.F., 346*n.*
 'A' Bombing Squadron (later *No. 216* Sqdn. R.A.F.), 65, 284
 Seaplane Defence Squadron (later *No. 13* Sqdn. R.N.A.S.), 73
No. 1, 93*n.*, 111, 120-1, 125, 181*n.*, 184
No. 2, 92
No. 3, 93*n.*, 299, 308, 312, 324*n.*, 337
No. 4, 81*n.*, 84, 93*n.*
No. 5, 81*n.*, 95, 97, 186*n.*, 281, 281*n.*, 282, 285, 297, 297*n.*, 301, 304, 311, 317, 323-4, 326-7, 335, 339, 342, 343, 346, 388

Squadrons—*continued*

- No. 6*, 102, 141
- No. 7*, 81*n.*, 95, 330; *No. 7a* formed from, 95*n.*
- No. 7a*, 93; formation, 95*n.*
- No. 8*, 172, 198
- No. 9*, 93*n.*, 141
- No. 10*, 81*n.*, 93*n.*, 111, 121, 132, 140, 142*n.*, 158, 181*n.*
- No. 11*, 93*n.*, 102; disbanded, 93*n.*
- No. 13* (formerly Seaplane Defence Squadron), 73
- No. 14*, 95*n.*, 330
- No. 16* (formerly A), 198*n.*
- No. 17*, 74, 102, 281*n.*
- See also *Nos. 201, 203, 205, 206, 208, 209, 210, 214*, and *216* Sqdns.
- R.A.F. and 'Orders of Battle'

German, see 'German Air Service'

Staden, bombed, 205

Steenwerck, bombed, 383-4

Stenness, Loch, seaplane station, 68, 77

Stevens, Sub-Lt. A. C., R.N.V.R., 70*n.*

Stockholme, Br. S.S., see '*Pegasus*'

Storm, Br. S.S., 58

Stranraer, see 'Larne'

Strath Beg, seaplane station, 68, 77

Struthers, Flt. Commr. J. G., 61

Stuart, Sir Campbell, *Secrets of Crewe House*, 226

Stuttgart, German seaplane carrier, 15*n.*

Submarines:

German: influence of on air expansion, 1-4; political effect of U-boat campaign in England and Germany, 2-4; Ad. Jellicoe's views, 2-3; revision of British naval policy, 2-3; unrestricted U-boat warfare begins (1 Feb. 1917), 47; numbers available, and disposition, 47; location of by wireless signals, 49; bomb-proof shelters for, at Bruges, 104-5; influence of on British plans in Flanders, 138

Measures against: Formation of Anti-submarine Division at the Admiralty, 3, 4, 45-6; mine-laying operations, 5; importance of Western approaches to the Channel, 45; scheme for additional air bases, 45-7; difficulties of aircraft

patrols off south coast of Ireland, 46-7; new aircraft bases, 46-7; use of aeroplanes for inshore patrol, 47; organization of South Western group and Portsmouth group of Air Stations, 48; seaplane patrols of waters off East Coast, 48-9; Naval Intelligence Division, 49-50; wireless tracking, 49-50; *tracing U*, 50; difficulties of recognition of Allied submarines, 50-1; convoy system adopted, 51-3; Flying-boat operations from Felixstowe, 52-5, 64-7; the 'Spider Web' patrol, 53-5; institution of ocean convoys, 59-63, effect of, on air operations, 59-60; airship patrols, 60-3, difficulties owing to German aircraft in southern part of North Sea, 62-3; Kite Balloon Destroyer Force, 63-4; additional balloon bases, 64; use of Handley Page aeroplanes for patrols off North Yorkshire coast, 65-6; North Sea mine barrage, 67-8, air organization for, 68; British aircraft patrols off French and Belgian coast, 68-74, 102; Dover-Dunkirk air organization, 69-74; employment of aircraft summarized, 75-6; aircraft bases (Seaplane, Airship, and Balloon) and patrol organization, 76-7; sightings and attacks of U-boats by aircraft (1917), 76, App. ii

Destruction of: *U.C.36*, 54; *U.B.39*, 55 (presumed); *U.69*, 63-4; *U.B.36*, 64 (presumed); *U.B.20*, 65; *U.C.1*, 65; *U.C.6*, 66; *U.B.32*, 69; *U.C.72*, 73; *U.C.70*, 86

Sueter, Cmdre. Murray F., 32

Sunbeam Arab, see 'Engines'

Supplies: Aircraft (in France), during German offensive (1918), 353-8; supplies on the move, 400-2; difficulties of (Lys), 400-2; Aircraft wastage (Mar.-Apr. 1918), 402-3

Supreme War Council, 263*n.*

Swift, Br. destroyer leader, 81

Swinton, Lt.-Col. E. D., 221

Sydney (Cape Breton, Canada), as port of assembly for ocean convoys, 59

Sydney, Australian L.Cr., 31

- Tanks (*British*), employment of, at battle of Cambrai, 227, 232, 234-5; (*German*), at Villers-Bretonneux, 388
- Taylor, Lt. M. S., 389
- Tees, River, U-boat activity off mouth of, 65
- Templeux-le-Guérard, bombed, 311
- Tenbrielen, bombed, 191*n*.
- Tennyson-D'Eyncourt, Sir E. H. W., 37*n*.
- Terror, Br. monitor, at bombardment of Zeebrugge and Ostend, 83-5, 89-90, 97
- Terschelling Light Vessel, 19, 21, 22
- Tertry, bombed, 311, 322
- Thiepval, 321
- Thourout, bombed, 95-6, 97, 181
- Thourout railway system, weight of bombs dropped on by R.N.A.S. (1917), 106
- Tiger, Br. B.Cr., 31
- Tilloy, bombed, 304
- Tincourt-Boucly, bombed, 311
- Tipnor (Portsmouth), balloon base, 64, 76
- Tirpitz battery, 89. *See also* 'Belgian Coast'
- Torpedo aircraft, *British*: 28, 32-3; *German*: operations against merchant shipping off east coast, 55-8; action against, 56-7; abandoned, 58
- Torquay, seaplane station, 76
- Tournai, bombed, 331
- Tracing U (*Unterseeboot*), special squared chart of North Sea, 50
- Tracing Z (*Zeppelin*), special squared chart of North Sea, 19*n*.
- Travecy, bombed, 306
- Treizeennes aerodrome, 376*n*.
- Trenchard, Maj.-Gen. Sir H. M., on low-flying attacks, 129*n*., 359*n*.; on conservation of air strength at Mesines, 133-4; plan for co-ordinating air effort at Ypres (7 July 1917), 143-4; and diversion of aircraft for home defence, 154; and need for closer co-operation between R.F.C. and infantry, 166, 201; and artillery co-operation, 214, 230*n*.; *Employment of the Royal Flying Corps in Defence*, 263, App. xiv; returns to England as Chief of Air Staff, 266*n*.
- Trollope, Capt. J. L., 317-18
- Tronchiennes, station bombed, 194
- Tudor, Rear-Ad. F. C. Tudor, Third Sea Lord, 3*n*., 25, 28
- Turnhouse, naval air base, 34, 43, 77
- Turrets, gun, flying from, 29-31, 38
- Tyrwhitt, Cmdre R. Y., 24, 85
- Tuskar Light, 46
- U.69, Ger. S/M, destruction of, 63-4
- U.B.20, Ger. S/M, destruction of, 65
- U.B.32, Ger. S/M, destruction of, 69
- U.B.36, Ger. S/M, presumed destruction of, 64
- U.B.39, Ger. S/M, presumed destruction of, 55
- U.C.1, Ger. S/M, destruction of, 65
- U.C.6, Ger. S/M, destruction of, 66
- U.C.36, Ger. S/M, destruction of, 54
- U.C.70, Ger. S/M, destruction of, 86
- U.C.72, Ger. S/M, destruction of, 73
- U-boats, *see* 'Submarines, German'
- United States of America, effect of entry into the war on naval situation, 53; aircraft of, 273-4
- Valenciennes, bombed, 331, 347
- Varsenaere, Ger. aerodrome, bombed, 96, 97
- Vaughan-Lee, Rear-Ad. C. L., Director of Air Services, 4
- Vendelles, bombed, 311
- Vendhuile, bombed, 297
- Vermand, bombed, 311
- Verton, 355
- Vickers, Messrs., 41
- Victoria Cross: award of, to Capt. W. A. Bishop, 129; to Lt. A. A. McLeod, 333-4
- Villers-Bretonneux aerodrome, 339
- Villers-Bretonneux, German attack on (24 Apr.), 387-8
- Villers-Carbonnel, bombed, 344
- Villers-Faucon, bombed, 311
- Villeseneux, Fr. aerodrome, 284
- Villiers, Lt.-Commr. O. G. G., 102
- Vindictive, Br. aircraft carrier, converted light cruiser (formerly *Cavendish*), 14
- Vivaise, Ger. aerodrome, bombed, 280
- Voss, Fliegerleutnant Werner, 189-90
- Vlieland, 20
- Vyfwegen, bombed, 122

- Waereghem, Ger. aerodrome, bombed, 198
- Walmer, naval air station, 57, 77
- Walser, Maj. A. A., 150
- War Cabinet, 3, 4; decision to withdraw squadrons from France for Home Defence, 152-5, 262-3; Man Power Committee, 263*n*.
- Warden, Lt. W. E., 333
- Warneton, bombed, 124, 132, 387
- Warneton line, 110
- Warrior*, Br. cruiser, 12
- Wassigny, bombed, 296, 304, 312
- 'Watson' fan, 126
- Watts, Air Mechanic J., 64
- Waygood-Otis, Messrs., 23
- Weather, effect on flying, 161-2, 168, 173, 175, 178, 180, 183, 185, 186, 191, 193, 198, 202-4, 206-13, 232-4, 237-41, 243, 247, 248, 255, 259, 261, 264, 280, 284*n*., 292-3, 295, 301, 322, 341-2, 347, 350-3, 374-9, 382, 386, 388, 397-8, 400
- Wemyss, Vice-Ad. Sir Rosslyn E., 30*n*.; appointed First Sea Lord, 31
- Wervicq, bombed, 124, 178, 186-8, 191*n*., 194, 379
- Westgate, seaplane station, 57, 76
- Weston, Gunner R. F., 392
- Weygand, Gen. M., 328*n*.
- Whatling, Chief Petty Officer V. F., 20
- Wilhelmshaven, German destroyers at, 78
- Williamson-Jones, 2nd Lt. C. E., 294
- Wilson, Gen. Sir H., 328
- Wings:
- R.F.C. and R.A.F.*:
- First* (Corps), 372
- Second* (Corps), 119*n*., App. iv
- Third* (Corps), 140, 141
- Ninth* (H.Q.), 111, 112*n*., 118, 129*n*., 135, 140, 143-4, 158, 162, 175, 177-8, 181, 198*n*., 230-1, 240, 250, 283; becomes *Ninth* (Day) Wing, 272*n*., 288, 299, 305, 308, 312, 320, 323, 335, 338, 344-6, 355-8, 372, 385, Apps. viii, ix
- Tenth* (Army), 371, 372
- Eleventh* (Army), 111, 118
- Thirteenth* (Army), 287, 312
- Fourteenth* (Army), 140, 141
- Fifteenth* (Corps), 140
- Twenty-second* (Army), 140, 207, 288, 291, 323
- Forty-first*, formation of, 198*n*., 350*n*.
- Fifty-first*, 352, 372
- Fifty-fourth* (Night): composition of, 272*n*.; 366, 372, 385
- R.N.A.S.*
- No. 1*, 81, 81*n*.
- No. 4*, 79, 81, 81*n*.
- No. 5*, 79, 81, 81*n*.
- Wireless Telegraphy:
- British*: use of, in locating U-boats and Zeppelins, 49; at bombardment of Zeebrugge, 84; number of R.F.C. wireless stations at Messines, 118*n*.; failure of artillery wireless organization, 359-61
- Calls, *K.B.C.I.*, 219; *L.L.*, 136, 137*n*.; *M.Q.*, 136, 137*n*.; *N.F.*, 136, 137*n*., 151. See also 'Zone calls'
- Interception scheme, 93-4, 115-17, 119; Compass Stations for, 115-16, 119, 186; Aerial Activity Office, 146
- With sound ranging section, 152
- German*: Central Wireless Warning Station, 117; interception organization, 117; failure of with artillery, 404
- Woodbridge, 2nd Lt. A. E., 142*n*.
- Wookey, 2nd Lt. H. C., 219-20, 223-4
- Woollett, Capt. H. W., 318, 384
- Wormwood Scrubbs, airship station, 76
- Wright, Lt.-Commr. Warwick, R.N.V.R., 100
- Yarmouth*, Br. L.Cr., 24; Zeppelin *L.23* attacked and destroyed by aeroplane launched from, 24-6, 31
- Yarmouth*, naval air station, 19-22, 57, 76-7
- Ypres, battles of, 1917:
- Allied strategy, influence of German submarine campaign on, 109, 138; general plan of offensive, 139; coastal landing, French and Belgian co-operation, 139; air concentration for the offensive, 140-3; influence of German air raids on England on, 152-5; relative strength of Allied and German aircraft, 141-2; disposition and

- Ypres, battles of, 1917—*continued*
 strength of R.F.C., App. v; instructions for employment of aircraft, 143-6, Apps. vii, viii; British Coastal operations, 90-2, 146-8, 150-2; German attack at Lombartzyde, 146-52; preliminary air offensive, 155-6; German line readjusted, 158-9; offensive opens (31 July), 160-9; Lange-marck, battle of, 172-9; minor operations, 179-80; Menin Road ridge, battle of, 180-90, scheme of employment of R.F.C. squadrons, 180-3; Polygon Wood, battle of, 190-6; Broodseinde and Poelcapelle, battles of, 202-5; Passchendaele, battles of, 205-13; Naval air co-operation in, 92-8
- Air offensive, instructions for, 145-6.
- Artillery co-operation (aeroplane), 151-2, 162, 171-4, 184, 202, 203, 206, 207, 210, 218-19
- Balloons: *British*, co-operation with aeroplanes in artillery work, development of, 150-2, 155, 184
- Bombing programme, 143-5, 176
- Bombing attacks: *British*, 94-9, 155-6, 162-5, 169-70, 179-80, 181-8, 191, 193-5, 197-8, 201-2, 206-9, 210*n.*, 211, 211*n.*; Orders for, Apps. vi, vii, viii; *German*, 148-9, 152-5
- Contact patrols, 161-2, 166-9, 173-5, 180, 191-2, 203, 204, 206, 209-11
- Fighting in the air, 155-8, 175, 185-6, 188-90, 194-6, 205, 207-8, 210-11
- German Air Service: strength of, 141-2, 156, 166, 196-7
- Low-flying attacks (*British*): 95, 161, 163-6, 175-8, 178*n.*, 179, 180; Orders for, 181*n.*; 184, 185, 188, 191, 193-4, 204, 206, 208-12; (*German*), 193
- Night-flying, development of, 196-8
- Patrols: *Counter-attack*, 173-5, 182-8, 192-3, 203-5, 206, 210; *Offensive*, 144, 158-9, 175-6, 178, 194, 210-11
- Photography, air, 190, 202, 207-8, 210
- Reconnaissances, air, 144-5, 148-9, 162, 187, 190, 206-7
- Sound ranging, 151-2
- Wireless interception scheme, 93-4
- Zandvoorde, 121; bombed, 191*n.*
- Zeebrugge:
 German destroyer and U-boat base, 47, 78; Seaplane base at, *Flanders I*, 14*n.*, 62, 69; German destroyer, raids from, 78-81; combined aircraft and coastal motor-boat attacks on German destroyers, 80-1; lock gates at, bombarded (12 May 1917), 82-4; bombed, 80, 95, 101; importance of as naval bombing target, 105-6; weight of bombs dropped on (1917), 106
- Zeppelin airships, *see* 'Airships, German'
- Zone calls, 184, 192, 203, 205, 206, 210, 213, 359-61, 369
- Zonnebeke, 202, 204
- Zweibrücken, bombed, 284

D
602
R34
v.4

Raleigh, (Sir) Walter Alexander
The war in the air

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY
